T H E   U N I V E R S I T Y   O F   A L B E R T A

RELEASE FORM

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TITLE OF THESIS   THE ACADEMIC PERFORMANCE
                      OF STUDENTS ADMITTED TO
                      AN ONTARIO UNIVERSITY

DEGREE FOR WHICH THESIS WAS PRESENTED   M.Ed.

YEAR THIS DEGREE GRANTED   1976

THE UNIVERSITY OF ALBERTA

THE ACADEMIC PERFORMANCE OF STUDENTS
ADMITTED TO AN ONTARIO UNIVERSITY

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF EDUCATION

DEPARTMENT OF EDUCATIONAL ADMINISTRATION

EDMONTON, ALBERTA
FALL, 1976

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and
recommend to the Faculty of Graduate Studies and Research, for
acceptance, a thesis entitled THE ACADEMIC PERFORMANCE OF
STUDENTS ADMITTED TO AN ONTARIO UNIVERSITY submitted by
ALEXANDER L. DARLING in partial fulfilment of the requirements
for the degree of Master of Education.

ABSTRACT

The academic performance of full-time students registered at
McMaster University for the first time in 1974-75 was examined. The data
were extracted from the Student Data Base and edited.

The "normal" applicant was defined as one who completed all the
subjects of Ontario Grade 13 at the first attempt in the school year prior
to first registration at the University. The academic performance of
registered students with different admission qualifications was compared
to that of normal applicants; the Chi-Square test was used for analysis.
Only in the Faculty of Humanities was there a significant difference in
the performance of normal applicants and others who completed Grade 13
at the first attempt; in that faculty normal applicants performed better.
Normal applicants performed better than mature students, and appeared to
perform better than those who required multiple attempts to complete
Grade 13. Students with General Certificate of Education qualifications
performed better than normal applicants. The results for other groups
are reported, but could not be analyzed.

The value of high school marks as predictors of university perfor-
mance for students who entered the University in 1969 and in 1974 was
examined; the correlation between Year I Overall Average and Admission
Average for the 1974 group by faculty and sex was calculated, and compared
to results previously reported for the 1969 group, using the test statistic
Z. There was no significant difference in correlations for the 1969 and
1974 groups, except for males in the Faculty of Science for whom the

correlation was significantly higher in 1974.

Within each faculty applicants with low Grade 13 averages, "marginal admittees", were identified and their performance examined. The university performance of this group was significantly lower than that of students with higher averages. Students admitted to the Faculty of Social Sciences on an experimental basis with averages below the stated minimum performed at a significantly lower level than marginal admittees in that faculty. There was no significant difference in the performance of marginal admittees when grouped in turn on the basis of sex, age, and whether the student had passed Grade 13 English. The performance of marginal admittees in Business, Engineering, and Science grouped on the basis of the number of credits obtained in Grade 13 Mathematics was compared. It appeared that those with less credits performed at a lower level in Business and Engineering, while the difference in Science was not statistically significant. Marginal admittees and mature students performed at the same level in the Faculty of Social Sciences; in Humanities the marginal admittees performed better than mature students.

The implications of these results for the selection process are discussed and recommendations presented. For graduates of Grade 13 it is recommended that Grade 13 marks continue to be one of the major criteria for selection, and that first consideration be given to those with higher averages. More detailed consideration should be given to those with lower averages; further investigation of the value of Grade 13 Mathematics marks as predictors is recommended. It is further recommended that there be a review of policies for mature students and applicants from other provinces. For other applicants no major changes in admission policies are recommended.

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Chapter I

INTRODUCTION

In a report to the Senate of McMaster University in the Province
of Ontario the need for an investigation of admission standards, success
rates, and drop-outs at the University was identified (Spenser, 1975).
The report recommended that admission standards be set in the light of
the findings of such an investigation.

In the Province of Ontario admission to a university normally is
granted on the basis of an applicant's academic performance in Grade 13.
The academic performance of Grade 13 graduates at McMaster University was
last studied for the group of graduates who registered in Year I at the
University in September 1969 (Boronkay, 1971a, 1971b, 1971c, 1971d, 1971e;
Khan and Rickard, 1971b).

For some of the University's programmes the number of qualified
applicants exceeds the number of places available, so that admission is
by selection.

This study was designed to provide information to those who are
responsible for evaluating the appropriateness of the admission require-
ments and the effectiveness of selection procedures, and for recommending
revisions to these requirements and procedures.

BACKGROUND

Prior to 1968 admission to universities in Ontario was based on a

student's performance in Grade 13 examinations administered by the
provincial Department of Education; thus, applicants seeking admission
to Ontario universities were assessed on a common testing instrument.
In 1967 an applicant seeking admission to McMaster University was
required to meet the "general requirements" of a weighted average of at
least 60.0 per cent in seven credits in at least four Grade 13 subjects.
In addition, specific Grade 13 subjects were required to satisfy the
"subject area requirements" of the various university programmes.
Applicants who had spent more than three years in Grades 11, 12 and 13
were required to present a higher weighted average (McMaster, 1967: 6-9).
Students seeking admission from other provinces and countries were
required to meet standards deemed equivalent to those required of Grade 13
applicants. Many universities made special provision for the admission
of mature students, who normally did not satisfy the specified admission
requirements. In the case of McMaster University, this provision had
existed since 1962.

The Grade 13 departmental examinations were administered for the
last time in 1967. Commencing with the 1967-68 school year marks were
assigned to students by high school teachers; the uniformity in marking
provided by the externally-administered examinations no longer existed.
Curriculum changes occurred since teachers did not have to teach to an
externally-administered examination. Each school had more freedom to
develop the course content so that students entering universities having
passed the same subjects could have different backgrounds.

With the abolition of departmental examinations other means of
assessment were explored. Prior to that time the Ontario Institute for
Studies in Education had developed a battery of tests known as the

Ontario Tests for Admission to College and University (OACU). The OACU
tests included the following:

      1. Ontario Scholastic Aptitude Test (OSAT), comprised of verbal
and mathematical parts;

      2. Ontario Physics Achievement Test (OPAT); and

      3. Ontario Mathematical Achievement Test (OMAT).

The OACU tests were administered in the high schools during the course
of the school year for the first time in 1966-67. In the 1967-68 McMaster
University Calendar, applicants were strongly advised to write the
Scholastic Aptitude Test and at least one of the achievement tests from
the OACU battery of tests (McMaster, 1967: 7). By the following year,
the 1968-69 Calendar stipulated that applicants were required to write
the aptitude test "as well as those Ontario Achievement Tests in the
subjects in which they are enrolled in Grade 13" (McMaster, 1968: 7).

      During 1966, the Service for Admission to College and University
(SACU) was incorporated for the purpose of administering tests on a
national basis. The SACU battery of tests was comprised of the Canadian
Scholastic Aptitude Test (CSAT), which was composed of verbal and math-
ematical parts, and the Canadian English Language Achievement Test (CELAT).
University applicants attending Ontario secondary schools in 1968-69 were
asked to provide the results of these tests at the time of application
for admission. In the years that followed, it became evident that very
few Ontario universities were using the SACU test scores in formulating
their admission decisions (Ferren, 1971: 14). Research results indicated
that the aptitude test scores were of limited value in predicting first-
year university performance; the best single predictor of first-year
performance continued to be the Grade 13 average, and the multiple

correlation was not significantly improved by the addition of the aptitude test scores (Khan and Richard, 1971: 17). In 1971, the Minister of University Affairs of the Province of Ontario made a statement to the Ontario university presidents regarding the future arrangements for the financing of the SACU testing programme. He noted that the major costs arising from the development and operation of the Programme had been funded through the payment of candidates' fees by the Department of Education, but that for 1971-72 these costs had become the responsibility of the Department of University Affairs. The Minister went on to state:

> . . . It is our belief, however, that since the tests are intended for university purposes, the decisions as to whether the expenditures are consistent with the benefits derived should rest with the individual institutions. As a result, to allow adequate time for complete assessment, the department will continue to fund the Service for Admission to College and University operations in Ontario for one more year. Commencing with the 1972-73 fiscal Year, the costs of SACU will have to be met by each institution using this service, and the required revenue derived either as a part of the regular operating grants or from charges to students (Boyes, 1971: 6).

Following debates within the universities and the Council of Ontario Universities, there was soon a general move to abandon the requirement that students present SACU Test results in support of applications for admission. In 1971-72 approximately 80,000 wrote the tests, but this dropped to about 50,000 in 1972-73, and further in the following year (SACU; 1973: 2). The decline in the number of candidates created a financial crisis which led to a curtailment of service and eventually, in 1975, the dissolution of SACU. A Mathematics placement test was developed before dissolution, at which time the Secretariat of the Association of Universities and Colleges of Canada (AUCC) assumed the responsibility for running the tests.

During the decade of the 1960s there was an ever-increasing

number of students seeking admission to Ontario universities. The
increase resulted from the increasing size of the age group from which
university populations were drawn and from a rising participation rate
in university education (Association of Commonwealth Universities, 1975:
811). Early in the 1970s the growth was arrested as the size of the age
group stabilized and as the participation rate declined. In 1974-75 the
numbers entering Ontario Universities increased and university enrolments
started to climb again after a period of stability. The 1975 Admission
cycle saw a further increase in the number of applications for admission
to Ontario universities which placed an increasing pressure on the number
of places available. During 1974-75, discussions on a new form of funding
arrangement for universities were taking place, and it became apparent
that the proportion of the Gross Provincial Product devoted to university
funding could not be expected to increase in future years (Newspaper
References). High school enrolment projections indicated that the number
of eligible applicants for admission to universities would probably start
to decline around 1980 (Watson, 1975), so that there was little incentive
for post-secondary institutions to overexpand their physical facilities.
The growth in applications in both 1974 and 1975 created a selection
problem which was more acute than had been experienced in the preceding
years of static enrolments.

At McMaster University the growth in undergraduate enrolment in
1974 and 1975 was greater than that experienced at most other Ontario
universities so that existing resources were severely taxed, and it appeared
that from 1976 admission to many, if not all, Year I programmes would be
by selection. The situation where the number of qualified applicants
exceeded the number of available places was uncommon to the experience of

most faculties. The absence of predictor variables other than high school marks compounded the difficulties, because of the variation in standards among high schools.

During 1975 educational standards were the subject of public debate, through the media of public speeches and the editorial columns of provincial newspapers (Newspaper References). During this debate there was some call for the return of standardized tests, at least in English and Mathematics. The alleged decline in education standards was one of the issues in the 1975 Ontario provincial election campaign. In the Fall of 1975 English and Mathematics Achievement Tests, CTEL and CMPT, were administered to freshmen entering four Ontario universities for research purposes. The tests were supplied by AUCC which had taken over SACU's operation; CTEL was essentially CELAT, and CMPT was the Mathematics placement test prepared by SACU in its last years of existence.

In the Spring of 1975 the Ministries of Education and of Colleges and Universities in Ontario agreed to the establishment of a joint study of the interface between secondary and post-secondary education, and of the adequacy of preparation of secondary school graduates for post-secondary education.

In the Fall of 1975 McMaster University faced the problem identified by R. W. B. Jackson in the "Foreword" to one of the volumes of the Atkinson Study (Fleming, 1962); Jackson stated that, in selecting applicants for admission to a university, one needed to balance training costs and selection costs. Training costs he defined as the costs of admitting those who subsequently failed at university; selection costs, the costs of excluding those who might have succeeded had they been admitted. At

McMaster University extensive admission studies were last conducted in 1970 (Boronkay, 1970). There was, therefore, a need for more current information for use in devising effective admission policies in a changed situation.

PROBLEM STATEMENT

The problems were stated in the form of questions.

The first problem was:

Does the academic performance in Year I programmes of students admitted to the University in September 1974 on the basis of a number of different qualifications differ significantly from that of students who completed Grade 13 in a single year?

Results of Session, a categorical variable, was used as the measure of academic performance in Year I.

The second problem was:

Is the value of academic performance in Grade 13, as measured by the Admission Average, as a predictor of university academic performance significantly different for students admitted in 1974 and 1969?

The Year I average was used as the measure of university academic performance, and the results reported by Khan and Rickard (1971b) were used for the 1969 group.

The third problem was:

Can other selected variables be used to increase the probability of selecting students who will succeed academically in Year I programmes?

The variables investigated were the sex of the applicant, age at entry to the University, the number of credits in Grade 13 Mathematics, and whether the applicant obtained credit in Grade 13 English. Results

of Session were used as the dependent variable.

<center>DELIMITATIONS</center>

In this study a magnetic tape file of 2886 records was created. There was one record per student, and each record contained nineteen data elements.

The records created were limited to those students who were registered in the 1974-75 Winter Session as full-time, Year I students in degree programmes in the Faculties of Business, Engineering, Humanities, Science, and Social Sciences, and in the School of Nursing.

The following were excluded:

1. those admitted to the School of Graduate Studies, the School of Medicine, and the Divinity College;

2. those who studied as part-time students;

3. those not registered in degree programmes;

4. those admitted above Year I; and

5. those who died during the 1974-75 Session.

The investigations conducted in this study were limited to students comprising a sub-set of those for whom records were created, namely those newly admitted in 1974 as full-time, Year I students registered in degree programmes during the 1974-75 Winter Session in the Faculties of Business, Engineering, Humanities, Science, and Social Sciences. Of the students for whom a record was created, the following were not included in the investigations:

1. those registered in the School of Nursing, and

2. those who had been registered prior to September 1974.

Of the nineteen data elements contained in each record, three

were used for the identification of students during the editing, checking and correcting of data, and seven were not used in the testing of hypotheses.

Among the remaining nine elements which were used in the testing of hypotheses, there was full reporting of the following five elements: Age at Entry, Sex, Applicant Status, Programme, and Results of Session.

Admission Average and Number of Grade 13 Mathematics Credits were recorded for all students admitted from Ontario Grade 13. English Grade 13 Mark was recorded for all students admitted from Ontario Grade 13 who had passed a Grade 13 English course, having a mark of 50 per cent or higher.

The Overall Average for the Year I programme at the University was not computed and recorded for those who withdrew during the course of the Winter Session, nor for those who missed final examinations through illness.

The study of university performance was limited to the performance of students in Year I programmes of McMaster University during 1974-75.

DEFINITIONS

Throughout the text a number of abbreviations will be used and are defined here.

University - these studies were conducted at McMaster University in the Province of Ontario, Canada; in the text "the University" is McMaster University.

ACT	- American College Test
ACT-C	- American College Test - Composite
ACT-M	- American College Test - Mathematical
ACT-V	- American College Test - Verbal
AUCC	- Association of Universities & Colleges of Canada
CAAT	- College of Applied Arts and Technology
CELAT	- Canadian English Language Achievement Test
CMPT	- Canadian Mathematics Placement Test
CSAT	- Canadian Scholastic Aptitude Test

CSAT-M   - Canadian Scholastic Aptitude Test - Mathematical
CSAT-V   - Canadian Scholastic Aptitude Test - Verbal
CTEL   - Canadian Test of English Language
GPA   - Grade Point Average
HSPR   - High School Percentile Rank
MINN MATH - Minnesota Mathematics Test
MSAT   - Minnesota Scholastic Aptitude Test
OACU   - Ontario Tests for Admission to College and University
OISE   - Ontario Institute for Studies in Education
OMAT   - Ontario Mathematical Achievement Test
OPAT   - Ontario Physics Achievement Test
OSAT   - Ontario Scholastic Aptitude Test
OSAT-M   - Ontario Scholastic Aptitude Test - Mathematical
OSAT-V   - Ontario Scholastic Aptitude Test - Verbal
OSEAT   - Ontario Standard English Achievement Test
r   - Pearson Product Moment Correlation Coefficient
SACU   - Service for Admission to College and University

SIGNIFICANCE OF THE STUDY

Previous studies in the area of admission to McMaster University and other universities in Ontario have concentrated on the performance of those admitted from the secondary schools of the province (Boronkay, 1971a, 1971b, 1971c, 1971d, 1971e; Fleming, 1959, 1962, 1965; Khan, Ransom, and Herbert, 1970; Khan and Rickard, 1971a, 1971b; Oksanen and Spencer, 1975a, 1975b). In this study the academic performance in the University of students who were admitted on the basis of a variety of academic qualifications was examined.

One objective in setting admission requirements is to ensure that those admitted to an institution stand a reasonable chance of success.

Another objective is to ensure equity of treatment for those presenting diverse academic qualifications in support of their applications for admission. The results of this study may assist in evaluating whether the achievement of these objectives is being enhanced or hindered by present practice, and whether changes are desirable.

The Admission Average has been the most used criterion in the determination of who is admitted to Ontario universities, because of its value as a predictor of Year I university performance. In this study the change in the predictive value of the Admission Average between 1969 and 1974 is examined, so that the appropriateness of continuing to rely on it in selecting students may be assessed.

The value of other variables as predictors of university performance is investigated in an attempt to improve the effectiveness of the selection procedures that are used in the admission of students to the University.

Chapter II

RESEARCH RELATED TO ADMISSION TO AND
PERFORMANCE AT POSTSECONDARY
INSTITUTIONS

In the search to improve the prediction inherent in admission
selection procedures, much research has been conducted and a variety of
data analysis techniques used. Some of the results have been published,
but much of the research has been "in-house" and the results unpublished.

This chapter commences with a discussion of the research in
Ontario prior to the abolition of departmental examinations which were
written for the last time in 1967. This is followed by a summary of the
research conducted on the performance of students admitted to McMaster
University.

Subsequent sections deal with the admission of secondary school
graduates, the admission of college graduates, mature students and the
value of "age" as a predictor of university performance, the academic
performance of males and females, and the performance of foreign students.

The chapter is concluded by a discussion of the research methol-
ogies employed previously.

ONTARIO STUDIES PRIOR TO THE ABOLITION
OF DEPARTMENTAL EXAMINATIONS

The most comprehensive study in Ontario was the Atkinson Study

of Utilization of Student Resources (1957-67) which was conducted at the time when students were admitted on the basis of Grade 13 Departmental Examination results. Of the thirteen volumes of the study, three are particularly relevant (Fleming, 1959, 1962, 1965). In volume 5, entitled Personal and Academic Factors as Predictors of First-Year Success In Ontario Universities, the results of a detailed study of the predictive ability of both personal and academic factors were reported (Fleming, 1959). It was noted that aptitude test scores were less effective as predictors than were measures of academic achievement; that the age of the student had some value as a predictor; and that the length of time taken to complete Grade 13 was an excellent predictor. Among all the non-academic predictors that were examined, the following proved to be the best: age of student, whether the student had been encouraged by a school to attend university, the teacher ratings, the industry of the student, the initiative of the student, and the time taken to complete Grade 13.

In a later study Fleming reported on the use of predictive factors for different university programmes (Fleming, 1962). He noted that the results varied among programmes; the predictive ability of the available variables was better for Applied Science than for Arts programmes. For Applied Science the best single predictor was the average of Grade 13 marks in Algebra, Geometry, Trigonometry and Statics, Physics, and Chemistry. The Grade 12 average provided a sufficiently independent contribution to warrant its inclusion in addition to the Grade 13 results. The value of the Scholastic Aptitude Test scores and principals' ratings were marginal. Students who required more than one year in Grade 13 appeared to need an average of at least 5 per cent higher in that grade to have the same chance as those who completed Grade 13 in a single year. It was suggested that

the most appropriate Admission requirements would be based on the Grade 13 average (all papers), the Grade 13 average in the Science subjects noted above, and the Grade 12 average, with higher averages required of those who took more than one year to complete Grade 13.

For the Arts programmes Fleming noted that there was a relatively high correlation between the Grade 13 average and the first-year university average. The addition of the Grade 12 average improved the prediction to some extent, while the addition of the verbal aptitude test score and the principal's rating added little to the prediction. The predictive ability for the categorical criterion variables, pass - conditional - fail - withdrew, was much less successful than for the prediction of the first-year university average. It was again suggested that candidates who spent more than one year in Grade 13 be required to present an admission average at least 5 per cent higher than those who spent a single year in that grade.

In the last of the three volumes, Fleming suggested that the Admission procedures should continue to rely heavily on some measure of high school achievement, irrespective of whether the measure was provided by departmental examinations or teacher marks (Fleming, 1965). He noted that the correlation between aptitude test scores and first-year university performance was low, although in some cases there appeared to be justification for combining them with the measures of academic achievement. The principals' ratings were related to first-year university success, but failed to add significantly to the achievement scores.

STUDIES ON THE PERFORMANCE OF STUDENTS
ADMITTED TO McMASTER UNIVERSITY

Following the abolition of the Grade 13 departmental examinations,
a series of studies on the performance of students admitted on the basis
of teacher marks was conducted at McMaster University (Boronkay, 1971a,
1971b, 1971c, 1971d, 1971e). Studies for each of the five faculties
which admitted students at the senior matriculation level were conducted.
In these studies Boronkay employed probability theory, correlation and
linear regression, and multiple correlation and regression analysis. The
research provided information by faculty on the following predictive
variables: time to complete Grade 13, aptitude and achievement test
scores, and high school academic record. The criterion variables were
first-year university average and a categorical variable, first-year
university results of session.

The sample size was small for Business, so Boronkay did not draw
any conclusions for that faculty. For all other faculties, it was noted
that students who required more than one year to complete Grade 13
appeared to require an admission average higher than the one-year Grade 13
students in order to have the same chance of success in first-year univ-
ersity programmes. This supported the findings of the Atkinson Study.
The best single predictor of success was one of the measures of achieve-
ment in Grade 13, either the admission average computed on the basis of
final Grade 13 marks or the interim Grade 13 average. The Pearson Product
Moment Correlation Coefficients ranged from a high of 0.78 in Engineering
to a low of 0.52 for those students entering first-year Social Sciences
programmes without Mathematics in Grade 13.

In Engineering the addition of the Ontario Physics Aptitude Test

scores to the interim average made a sufficiently useful independent contribution to the prediction of first-year university average to justify its inclusion in the prediction equation. The Grade 12 average made a very slight additional contribution to the prediction of the first-year average when combined with the two previous variables. It was noted that one scheme using three predictors (interim average, Mathematics/ Science average, and Grade 12 average) could have eliminated a substantial number of the potentially unsuccessful students without eliminating too many of the potentially successful students.

Within the group that entered Humanities there were two sub-groups: one group comprised students who had written the Ontario Mathematics Achievement Test (OMAT), and the other those who had not. For those who wrote OMAT the best single predictor was the admission average ($r = 0.78$), and for the other group the interim average proved to be the best predictor ($r = 0.59$). The addition of the Grade 12 average for both groups improved the prediction of the Year I average. The addition of the CSAT-M scores for the OMAT group, and the CSAT-V for the other group made sufficiently independent contributions to justify taking these third predictor variables into consideration.

For Science the best single predictor of the Year I average was the interim average; the prediction was improved by adding the Grade 12 average, and subsequently the CSAT-M score. For Social Sciences the best single predictor was the admission average; adding the CSAT-V score and subsequently the Grade 12 average made improvements to the prediction of first-year average.

From these studies the use of proportional analysis was developed. Boronkay and Bradley (1972) described its use in a paper published in

Forum, a quarterly journal latterly published by the Ontario University
Registrars' Association. Most Ontario Universities, they noted, had
admitted students solely on the basis of their high school records;
when departmental examinations existed, there was a relatively high
correlation between the Grade 13 results and the first-year university
results. They suggested that the value of the Grade 13 marks as predictors
might deteriorate, resulting in difficulties for universities in future
years if the demand for places were to exceed the supply and admission
by selection were to be necessary. While multiple regression analysis
was used extensively in the United States to derive prediction equations
for estimating first-year university GPAs, Boronkay and Bradley argued
that it was primarily useful for predicting group performance; in their
view it did not provide sufficiently accurate estimates of individual
performance to justify its use in deciding whether an individual should
be admitted. They noted that this procedure assumed a linear relation
between the predictor and criterion variables, and, therefore, suggested
the use of proportional analysis which did not have to assume the exist-
ence of a linear relationship. First-year university result of session
was used as a categorical criterion variable, the best predictor
variables were identified, two dimensional arrays were constructed, and
then successive predictors were added.

   In an unpublished series of papers Boronkay reported on the use
of proportional analysis for each of the McMaster faculties (Boronkay,
1972). In these studies, hypothetical admission standards were set.
Proportional analysis was used to determine whether the efficiency of
admission selection could be improved by using other predictor variables
in addition to the Grade 13 average. The subjects for the study were

students entering the University immediately after spending one year in Grade 13; four groups of entering students were used for all faculties except Business where intakes for three years were included. For each faculty the hypothetical admission standard was set at a higher Grade 13 average than that required normally for admission; the standards varied among the faculties, because the distribution of admission averages in each faculty varied. The hypothetical admission averages required were as follows: 62 per cent in Social Sciences; 66 per cent in Business, Humanities, and Science; and 70 per cent in Engineering. The dependent variable was the first-year university results of session with two categories: successful (including pass and condition) and unsuccessful (including failure and withdrawal).

Boronkay reported the results for each faculty, assuming that the hypothetical standard applied. For Business, the use of the Grade 13 average, the Grade 12 average, and the CSAT-V scores in appropriate combinations would have permitted the admission of 55 per cent more students with no appreciable change in the failure rate. Fifteen per cent more students could have been admitted to Social Sciences with an increase in the unsuccessful group from 8 to 10 per cent, and 14 per cent more could have been admitted to Humanities with an increase in the unsuccessful group from 9 to 10 per cent. By using the Grade 13 average, the Grade 12 average, and the CSAT-M scores in an appropriate combination for the Faculty of Science 16 per cent more could have been admitted with a corresponding rise in the unsuccessful group from 19 to 24 per cent. In Engineering, using the Grade 13 average, the Mathematics/Science average, and the CSAT-M score, 35 per cent more could have been admitted with an increase in the unsuccessful group from 11 to 16 per cent.

A series of studies on students completing Grade 13 in 1967, 1968, and 1969 was conducted under the auspices of the Ontario Institute for Studies in Education (Khan, Ransom, and Herbert, 1970; Khan and Rickard, 1971a and 1971b).

The purpose of the first study, was to determine the extent to which the Ontario Tests for Admission to College and University, Grade 13 examination marks, Grade 12 and Grade 13 teacher marks predicted first-year university achievement (Khan, Ransom, and Herbert, 1970). The OACU battery of tests included the Ontario Scholastic Aptitude Tests (OSAT), both verbal and Mathematical, and achievement tests in Physics (OPAT), Mathematics (OMAT), and English (OSEAT). The subjects were drawn from the last group of students to write departmental examinations. For admission, such students were required to have successfully completed seven credits in Grade 13 with an overall average of at least 60.0 per cent. The analysis was conducted by university, programme, and sex for students enrolled in ten universities. The results for McMaster students showed that the mean scores on the OACU Tests were higher for those entering Science and Engineering than for the other faculties; this was more pronounced on the quantitative tests than on the verbal test. The correlations between measures of university achievement and high school achievement for students in Humanities and Social Sciences were higher for females than they were for males. The conclusions drawn from this study were that there was no marked difference among the students entering different universities, that the correlations with first-year university achievement for achievement test scores were higher than for the aptitude test scores, and that the predictive ability of the independent variables was higher for females than for males. It was suggested that there would be increasing diversity

in future years since the subjects in this study were the last students to write departmental examinations.

The second study, by Khan and Rickard (1971a), was conducted for students who entered universities in 1968; the purpose was to provide additional information on the validity of the OACU Tests. Ten universities were included and in the case of Queens, McMaster and Carleton Universities data were supplied for second-year students too. Wherever possible the analysis was partitioned by university, programme, and sex. In general, the findings substantiated those reported in the previous study; the higher correlation of teacher marks and first-year university average for females than for males was noted. The predictive ability of the various OACU Tests varied among programmes and universities, but the teacher-reported marks remained an excellent predictor of freshmen performance.

The subjects in the third study, Khan and Rickard (1971b), were those who entered the universities in 1969. By this time the Service for Admission to Colleges and Universities had been established and was administering the Canadian Scholastic Aptitude Test (CSAT) and the Canadian English Language Achievement Test (CELAT); OPAT and OMAT had continued to be administered in Ontario. Eight universities supplied data. The results were essentially the same as in the two preceding years. Khan and Rickard (1971b: 17) noted that the lack of significant contribution by the standardized tests to the prediction of first-year university achievement appeared to result from the higher correlation of the standardized test scores with the teacher marks than with freshmen averages. They suggested that the utility of the tests in the teaching-learning situation rather than solely in their predictive effectiveness

be explored.

Oksanen and Spencer (1975a, 1975b) attempted to assess the
value of several measures of academic ability available when students
started university study as predictors of student performance in intro-
ductory level courses in the Social Sciences. They employed multiple
regression analysis; predictor and criterion variables were standardized
and measured in standard deviations about the means. Dummy variables
of value either zero or one were used for variables such as sex which
may have either of two values. The sample was comprised of students
registered in the period 1968-71 in at least one introductory Social
Science subject; these subjects were defined as Anthropology, Economics,
Geography, Political Science, Psychology, Religion and Sociology for the
purposes of the study. The 4098 subjects were full-time undergraduate
students registered in degree programmes and admitted on the basis of
Ontario senior matriculation, also having written the Ontario Aptitude
Tests. In the analysis, the following thirteen independent variables
were used: high school average, OSAT-V score, OSAT-M score, dummy
variable equal to one if subject completed Mathematics in the last year
of high school, dummy variable equal to one for a non-freshman, dummy
variable equal to one for a female, dummy variable equal to one if subject
had not written a departmental examination, and six interacting variables.
The interacting variables were the product of the sex dummy variable and
the other six independent variables. From the analysis it was concluded
that the high school average and OSAT-V scores were significant predictors
with the former accounting for more of the variance than did the OSAT-V.
The OSAT-M score was a significant predictor in the case of Psychology
and Economics where the coefficient was positive and in Religion where

the coefficient was negative. The dummy variable used to indicate the
student had taken high school Mathematics proved to be significant in
the case of Economics where it was positive and in the case of Anthro-
pology where it was negative. It was also noted that the sex variable
was significant and positive in all subjects except Economics, Psychology,
and Geography. This indicated that females tended to perform better
than males, all other things being equal.

In a report to the McMaster Senate on withdrawals from the
University, Committee members noted that the greatest number of drop-
outs between Years I and II appeared to be from among students whose
academic performance was of a low standard (Spenser, 1975). The records
and admission average of Year I students who had withdrawn were examined
and it was noted that:

> . . . it is evident that there is a _prima facie_ correlation of
> low success rate and high drop-out rate with low admission
> average. It is also significant that in two faculties students
> whose admission average cannot be calculated, i.e., students who
> belong to one of the following categories:
>
> 1. Mature students
> 2. Students who have completed high school outside Canada
> 3. Students who have completed high school outside Ontario
> 4. Transfers from Ontario Colleges of Applied Arts and Technology
> 5. Transfers into Year I from other universities
> have as high a drop-out rate as students with an admission
> average of less than 65 (Spenser, 1975: 26).

The Committee concluded its remarks:

> . . . We offer these results of our preliminary study in the hope that
> the Committee on Admissions of each faculty will carry out a thorough
> investigation of correlations between admission standards, success
> rate and drop-out rate, and will make recommendations regarding
> the admission standards of individual faculties in the light of
> the results of such an investigation (Spenser, 1975: 27).

ADMISSION OF SECONDARY SCHOOL
GRADUATES TO UNIVERSITIES

A study was conducted at Trent University in Ontario in which the
subjects were the incoming freshmen of 1972-73 who were registered in the
final year of an Ontario secondary school programme at the time of
selection (Pollock, 1972; Pollock, Bowman, Gendreau, and Gendreau,
undated). The sample size was approximately 500. Those applying for
admission were divided into five groups: a group to whom open admission
would be granted; a group chosen on the basis of an in-depth structured
interview; a group admitted solely on the basis of their high school
records; a group admitted on the basis of school recommendations; and
a group admitted on the basis of aptitude test scores. A sixth group
was comprised of students who qualified through the traditional procedures,
and included admissible students who were not admitted in one of the
other five categories. No student was informed of the group in which he
or she had been placed. Success was measured by the first-year grades,
the number of drop-outs, the number of unsuccessful students, the general
adjustment to university life, and the students' personal satisfaction
with university life. All students were asked to complete an attitude
questionnaire after accepting the offer of admission, and in the second
term a random sample was interviewed by trained interviewers to determine
personal satisfaction with the university in general, with courses, with
teaching methods, with social life, and with finances. Any student who
withdrew was asked to complete a questionnaire regarding satisfaction
with the university experience and reason for withdrawing.

The class was similar to those of previous years in terms of
geographic distribution and Grade 13 mark distribution. The six groups
were similar in distribution by sex and financial status, and in

attitudes, interview responses, and withdrawal rates. For those completing
the year there were no significant differences in the mean GPAs among the
six groups, although there was significant difference between the sexes.
It appeared that the females had fewer students placed on probation or
rusticated, but the cell frequencies were too small for statistical
analysis. There was a tendency toward a slightly higher correlation
between the selection criteria and the first-year GPA for females than
for males. An examination of the records of those students who would
not normally have been admitted revealed that 81 per cent succeeded in
their first year in university.

In the Province of Alberta there have been a number of studies
on the performance of students entering the universities of the province
from the secondary schools (Black, 1959, 1960, 1961, 1964, 1966, 1969;
Black and Knowles, 1965a, 1965b; Conklin and Ogston, 1968; Evenson and
Smith, 1957, 1958; Knowles, 1965; Mack, 1963; Nyberg and Baril, 1973).
All of these studies were conducted while Grade 12 examinations were still
administered by the Department of Education. In general, the Grade 12 marks
proved to be the best predictor of success, and the aptitude test scores
improved the correlation only slightly. Multiple correlations were gen-
erally clustered around 0.6; correlations between independent and dependent
variables were higher for females than for males (Black and Knowles,
1965a). There were also differences according to the faculty and programme
that the student sought to enter (Black and Knowles, 1965a; Knowles, 1965;
Mack, 1963).

ADMISSION OF COLLEGE STUDENTS

In May 1965 Bill 153, An Act to Amend the Department of Education Act

(Ontario, 1965), was introduced to the Ontario Provincial Parliament. It provided for the establishment of a system of colleges of applied arts and technology which was soon created. The colleges provide an alternative to university education and do not serve as feeder institutions for the universities. Although the colleges do not offer transfer programmes, college graduates may be admitted to universities on individual merit.

Isaacs (1974) reported on the academic progress of students first registered in Ontario universities in 1973-74 after attending colleges of applied arts and technology (CAATs). The 847 students represented 2.03 per cent of new students entering the Ontario university system. The results, compiled from information received from all universities, revealed that almost 20 per cent of this group failed, but over 21 per cent achieved above average standing. There were no significant differences in the academic performances of those admitted with a CAAT diploma and those who were admitted without the diploma. The only group who performed significantly better was the group of those admitted to universities and granted advanced standing. This might be expected as first-class standing in the work at the CAAT is normally required before advanced standing is granted.

In the Province of Alberta many of the college programmes are designed for transfer to university study, unlike those in Ontario. The studies of the performance of former college students in the universities are more extensive. Falkenberg (1969) reported on the success of junior college transfers from the recognized transfer programmes and Eaton (1971) reported on the success of those transferring from the Combined University Matriculation Programme. Batt and Janssen (1974) reported on students admitted to the Faculty of Business Administration and Commerce at The

University of Alberta from colleges programmes generally regarded as non-transferrable. Two measures of academic performance were used; the first was the university GPA and the second was the category into which the student was placed for the purposes of academic promotion. It was reported that there appeared to be no significant difference in the academic performance of students who transferred to the university from a college and of those who had completed all their post-secondary education at the university. Also, within the group of students who had transferred from a college those who had not met the normal admission requirements appeared to perform as well as those who had done so; it was noted, however, that the "non-admissible" students were admitted selectively.

The literature on students transferring from colleges to universities in the United States is extensive and the findings are inconsistent. Wray and Leischuck noted that:

> . . . at different institutions different predictors seem to have varying success. Therefore, there seems to be a need for more research in order to identify and isolate those factors offering greatest potential for predicting post-transfer academic performance (Wray and Leischuck, 1971: 11).

Most of the literature in the United States deals with students entering universities from college programmes that were designed to permit transfer, whereas the college programmes in Ontario are not designed to do so. Burke (1973) reviewed the performance of three groups of students transferring to the senior division of The University of Connecticut: those transferring from community colleges, a random sample of those transferring from other colleges and universities (but not community colleges), and a random sample drawn from those transferring from the freshmen-sophomore branches of the university. The independent variables were previous GPA, high school percentile rank, SAT-V score, and SAT-M score. It was found

that the single best predictor was the previous GPA, but in no case did it account for more than 37 per cent of the variance. The best predictions were obtained for the students transferring from the freshmen-sophomore branches of the university, and the worst were for the students transferring from community colleges. The phenomenon of "transfer shock" was most pronounced for the community college transfers.

Grieder and Cassady (1974) noted that many college students in Florida complete a two-year terminal programme and then seek to transfer. They reported on an analysis of 163 students entering the University of West Florida in the fall quarter of 1973-74 from terminal college programmes, and noted that the withdrawal rate was smaller for this group than for the total student body, that there were fewer named on the Provost's Honor List, and that the mean GPAs were not dignificantly different from those of other students.

MATURE STUDENT ADMISSION AND "AGE" AS A PREDICTOR OF UNIVERSITY PERFORMANCE

Within Ontario, Fleming (1959) noted that age appeared to have some value as a predictor of first-year university performance. The academic performance of veterans had been the subject of research after the Second World War when the ranks of college students were swelled by the return of veterans. Atkinson (1948) reported that the performance of veterans was appreciably higher than that of regularly admitted students.

Reed and Murphy (1975) compared the academic performance of veterans, mature adults, and young adults. They assumed that there would be a marked difference between the first two groups and the third group,

and that a relationship would be found between maturity, as measured
by age and life experience, and higher academic performance. Evidence
from other studies, they noted, suggested that mature adults were more
aware of the value of college degrees, more able to draw on maturity in
their college experience, and more successful in academic performance
as measured by college GPA than were young adults (Fagin, 1971; Groenk,
1969; Ice, 1971; Perkins, 1971; Ryan, 1969; Stephen and Wheeler, 1969;
Winslow, 1968). Reed and Murphy defined a mature adult as one of at
least twenty years of age at the time of entry, a veteran as one who
entered college after discharge from the Armed Forces, and a young adult
as being less than twenty at the time of entry. The randomly-selected,
non-veteran sample was placed into five groups by age at time of entry
to college. The analysis revealed:

1. that women perform significantly better than men,

2. that GPA tended to increase with class rank (freshmen,
   sophomore, etc.),

3. that when the samples were grouped on the basis of defined
   level of maturity, there was no significant difference in
   the mean grade-point average among the three compared
   groups,

4. that when the samples were grouped on the basis of age
   at entry to college, the eighteen-year olds and those
   over twenty-one tended to perform at about the same GPA
   levels; that the nineteen and twenty-year olds tended
   to perform at lower but significantly different GPA
   levels; and that the seventeen-year olds performed at
   higher and significantly different GPA levels.

In conclusion, it was noted that while previous research indicated that veterans performed better than the normal student, this was not confirmed but at least they did not perform more poorly.

In Canada within Alberta there have been at least two studies of the success of mature age students. Perkins (1971) reported on the findings of such a study conducted at the University of Lethbridge. Mature students were those who were over twenty-one and did not possess the normal matriculation requirements. The performance of mature students and regularly admitted freshmen on the College Qualification Tests, and the fall and spring GPAs were compared. The regularly admitted freshmen were grouped by the number of attempts on Grade 12 examinations; at that time six Grade 12 subjects were required for university entrance within the Province of Alberta. The mature student group had the lowest mean score on the College Qualification Tests, but the highest mean GPA. At The University of Alberta, Batt (1972) concluded that the performance of mature students admitted to the Faculty of Education was at least as good as that of regularly admitted students.

Paraskevopoulos and Robinson (1969) reported on a study designed to investigate whether veterans achieved higher first semester GPAs in college than non-veterans. Each veteran was matched with non-veterans on year and term of entry, campus, college, curriculum where possible, ACT composite score, and high school percentile rank. The mean first-term GPA for the non-veterans matching a particular veteran, and the difference between this mean and the particular veteran's first-term GPA were determined. The application of a t-test for matched pairs on the mean of the differences so obtained indicated that the performance of the veterans was significantly higher at the .01 level.

THE ACADEMIC PERFORMANCE OF MALES AND FEMALES

The differences in performance for males and females noted in the Canadian studies (Black and Knowles, 1965a; Khan, Ransom, and Herbert, 1970; Khan and Rickard, 1971a, 1971b; Oksanen and Spencer, 1975a; Pollock, Bowman, Gendreau, and Gendreau, undated) have been reflected in the research conducted in the United States. Northby (1958), reporting on a high school graduating class in the State of Connecticut, noted that the females had superior achievement as measured by rank in class, although aptitude test scores had been noted to be little different by Freeman and Myles (1950). Phelps (1973) confirmed these findings in reporting three studies on female performance in high school, while Bowers (1963) noted significant differences in the number and kind of high school units earned by males and females. Paraskevopoulos and Robinson (1967) reported that males scored higher than females on tests of a quantitative nature, whereas females scored higher than males on verbal aptitude tests. The researchers, therefore, investigated the desirability of using different predictive regression equations for males and females. They discovered that the difference in regression coefficients was not significant, but that the difference in the criterion intercepts, the difference in the predicted first-year GPAs, was statistically significant. If separate regression equations had been developed, the female first-year GPA would have been .02 higher than that for males with the same high school percentile rank and aptitude test scores (Paraskevopoulos and Robinson, 1970).

ADMISSION OF FOREIGN STUDENTS

Research literature on the performance of foreign students is
limited, notwithstanding the large increases that have taken place in
the number of foreign students enrolled in North American post-secondary
institutions. Baker (1975) examined the performance of foreign students
by entry method to post-secondary education, within the colleges of a
university, and by national background. He noted that there appeared to
be little problem with those students who were the products of schools
patterned on the English model, such as one finds in Hong Kong and the
English-speaking African nations.

RESEARCH METHODOLOGIES

Much of the research conducted on admission to universities has
involved the measuring of student variables, the calculation of Pearson
Product Moment Correlation Coefficients, and the development of multiple
correlation coefficients and linear regression equations. Munday (1970)
investigated the distribution of several hundred multiple correlation
coefficients obtained between ACT scores and high school grades on the one
hand and first-year college grades for a number of different institutions
on the other. He noted that they ranged from a low of 0.29 to a high of
0.80, and that the variation could be accounted for in part by the vari-
ation in talent of the students entering the institutions, the greater
predictability of academic achievement among girls than boys, and diff-
erences in personality traits. Munday suggested that at least three sets
of factors might be investigated to explain the variance of the dependent
and independent variables: one might be the institutional characteristics;

a second, the student characteristics; and the third, the evaluation procedures. He investigated the institutional variables, and reported that the highest correlations were obtained in those institutions where:

1. a high proportion of the students were in dormitories
    or under college supervision;

2. where there was a wide range of talent as measured by
    the standard deviation on the ACT-C score;

3. where there was a freshmen enrolment less than 500; and

4. where the mean ability level of the freshmen was greater
    than the national average as measured by the ACT-C score.

However, the institutional variables accounted for only a small amount of the variance, 12 per cent being the highest.

Whitney and Boyd (1971) investigated some of the limitations on the expected efficiency of decisions based on factors such as test scores and high school records. They noted that, if one were to admit all those with a predictor variable of greater than a specified value, and if the criterion variable for success is defined, then there would be four groups of students:

Group   I - those admitted correctly;

Group   II - those admitted incorrectly;

Group   III - those rejected incorrectly; and

Group   IV - those rejected correctly.

For the most efficient admission policy one would seek to maximize groups I and IV. If one were to plot the values of the predictor and criterion variables for each student and the correlation coefficient were 1.0, all points would lie on the regression line; nobody would fall in groups II and III. This would be impossible, they noted, because of the measure-

ment errors for predictor and criterion variables and because the criterion and predictor variables attempt to represent different things. The development of the regression line implies:

1. that the relationship is linear;

2. that the criterion scores are equally variable for all groups of students with similar predictor scores; and

3. predictor and criterion variables are normally distributed.

Whitney and Boyd calculated the percentage efficiency at different levels of selectivity given differing values of the Pearson Product Moment Correlation Coefficient. In doing so they assumed that there was bivariate normality for the predictor and the criterion variables. They then attempted to validate the selected efficiencies using a sample drawn from the 1969 University of Iowa freshmen class. The results showed that the actual efficiency was less than that calculated . This resulted from the tendency for predictive correlations to "shrink" when the optimally developed weights for one group are applied to a different group. They noted also that multiple correlations are usually developed on the basis of admitted students only, thereby limiting the value of the coefficients derived.

Sometimes separate predictive regression equations are derived for different colleges within a single university. McVay (1973) reported that at North Carolina State University eight prediction equations had been developed, one for each college. She hypothesized that there would be no significant difference in using a single prediction equation for the university. This was found to be the case.

Where admission is based on the measurement of two predictor variables, a student may obtain a high score on one predictor and a low

score on the other; obtaining a high score on one variable may gain him admission to a university. Menacker, Paraskevopoulos, and Robinson (1971) investigated the performance of students who had discrepant admission scores. The researchers reported that at the University of Illinois, which had more applications than places, a selection index was computed from the high school percentile rank and ACT-C score; some applicants gained admission because one score was high, although the other was low. The performance of such beginning freshmen in 1966 was investigated. The criterion variable measured academic success at the end of a full academic year using categories of clear, probation, with-drew, or dropped. Of those in the lowest quartile on high school percentile rank, none were in the category "clear" after one year; of the original twenty-seven subjects seven were on probation, and the remainder were in the other two categories. For those in the third quartile the success rate was higher, although those with an ACT-C score of seventeen or eighteen had a low success rate. As a result of this study the University of Illinois established new admission procedures for applicants with discrepant admission scores. These procedures were similar to those using proportional analysis suggested by Bradley and Boronkay (1972).

Much of the research has been limited to the prediction of performance in the first semester, quarter, or year at the post-secondary institution. Berdie and Prestwood (1975) suggested that more appropriate criterion variables might be the cumulative GPA or the dichotomous variable graduation/non-graduation. They investigated the efficiency of three variables as they related to the prediction of first-year and final cumulative GPAs. The subjects were 100 students at the University of Minnesota who entered the Institute of Technology in the fall of 1966

and completed the first quarter successfully. The predictor variables were high school percentile rank, percentile score on the Minnesota Scholastic Aptitude Test (MSAT), and score on the Minnesota Mathematics Test (MINN MATH). For those who graduated from the Institute of Technology only the high school percentile rank and the MINN MATH score correlated significantly with the first-year GPA. None of the predictors correlated significantly with the final GPA. The value of predictors beyond the first-year performance at university was found to be limited by Humphreys (1968). He examined the performance of students throughout a four-year programme in semesters one to eight, and derived correlation coefficients among the GPAs for all semesters and with the admission predictor variables such as rank in class and standard test scores.

In a review of the 1970-71 literature on the prediction of college student achievement, Cramer and Stevic (1971) selected the work of Weiss as holding interesting possibilities for future development. Weiss (1970) noted that there had been articles on the merits of statistical and of subjective/clinical approaches to the admission of students, but that statistical approaches had proven superior, although there had been no agreement on a particular method of implementation. He noted that high school rank had been found consistently to be the single best predictor, although other variables had been of value too in the development of prediction equations; however, the multiple correlations derived seldom exceeded 0.7. He suggested that an alternative approach was to develop a rank order of probable academic success. Merwin (1974) had demonstrated that the relationship between the probable accuracy of a predictor and the proportion of successful students was geometric and non-linear, so that the predictive accuracy is greatest at the high and low extremes.

He had suggested, therefore, that in assigning weights one should seek
to expand the range and dichotomize the extremes, thereby increasing the
value of the predictive system. For this study Weiss selected 250
students in a small eastern co-educational college in the United States,
all of whom started and completed the freshmen year. High school rank
and SAT scores were available for all subjects. These scores were
converted to a numerical value through a non-linear formula; the non-
linearity was accomplished by squaring the numerators in the formula.
The numbers for each variable were totalled and a rank order assigned.
At the end of the year, the GPA for each subject was computed. Using
this procedure a Spearman Rank Order Correlation Coefficient of 0.82 was
derived, whereas with the non-linear aspect of the formula omitted the
correlation coefficient was only 0.47. He noted that there was difficulty
in setting the weights and in this particular case they had been chosen
first subjectively and then had been empirically adjusted. This had been
a first attempt to develop a non-linear predictive system, and Weiss
suggested that there was some value in the non-linear assignment of weights.

SUMMARY

In the first two sections of this chapter previous research into
the performance of students admitted to Ontario universities and McMaster
University in particular was described. Subsequent sections dealt with
the admission of secondary school graduates, the admission of college
graduates, mature students and the value of "age" as a predictor of
university performance, the academic performance of males and females, and
the performance of foreign students employed in previous studies.

The chapter was concluded by a discussion of research methodologies.

Chapter III

METHODOLOGY AND DATA RETRIEVAL

This study results from a report to the Senate of McMaster University (Spenser, 1975) and from a need to review admission practices at a time when the number of qualified applicants exceeds the number of places available in some faculties. For a university with more applicants than places, it is suggested that an appropriate strategy in the selection process might be to minimize the proportion of students who withdraw or fail. The student who is admitted and subsequently withdraws occupies a place which could have been utilized by another student. Spenser (1975) suggested that the withdrawal of students from McMaster University might be related to the academic performance as measured by the admission average. Astin (1969) noted that the withdrawal was related to a student's academic achievement as measured by the grade-point average. For the criterion variable it is, therefore, desirable to employ a categorical variable which permits the inclusion in the study of students who withdraw. In seeking to implement a "minimum loss" strategy one may wish to investigate most fully the records of those students whose performance is most likely to be marginal, which from previous research findings might be expected to be those who have an admission average only slightly in excess of that required for admission.

The subjects included in the study were those full-time students who entered Year I programmes of the University in September 1974, this

being the last group for whom Year I results were available. The academic

regulations and grading scale of the University were changed in September

1974, so it was not desirable to include those admitted in earlier years

among the subjects. In previous research it was possible to include the

Grade 12 average, but in recent years the secondary schools of Ontario

have ceased to report Grade 12 marks as percentages and so averages are

not readily obtainable. It should be noted also that the Year I class

entering McMaster University in September 1974 had not written stand-

ardized tests such as the OACU and SACU tests.

A procedure was devised whereby a magnetic tape file containing

a record for each full-time student in Year I programmes in 1974-75 was

created. The structure of the file was defined in such a manner that

the data could be used in this and other studies in the future. From the

research literature areas of interest were identified, data elements

defined, and a coding structure devised; the data elements identified and

the reasons for their identification are described in APPENDIX A, and the

detailed coding structure appears as APPENDIX B. The data were retrieved

from the McMaster University Student Data Base, and transformed to the

codes specified. The specifications for the retrieval program appear as

APPENDIX C. A printed copy of the contents of the tape file and an edit

report were provided to facilitate the checking and correcting of missing

or potentially invalid data. A mechanism was provided for updating the

tape file with corrected data, and the corrected tape was used as input

in using SPSS (Statistical Package for the Social Sciences) for the data

analysis.

METHODOLOGY

The first problem was to determine whether the academic per-
formance in Year I programmes of students admitted to McMaster University
in September 1974 on the basis of a variety of qualifications differed
from that of the "normally-admitted" students, who were defined as those
who completed Ontario Grade 13 successfully in a single year in 1974.
To differentiate among the qualifications presented for admission an
Applicant Status was specified and coded. The categorical criterion
variable, Results of Session, was used to permit the inclusion of students
who withdrew during the session. The data were analyzed using the Chi-
Square test.

The Chi-Square test was used extensively in this study, since it
provided a means of analysis in cases where categorical variables were
employed. The categorical criterion variable Results of Session was used,
since the use of University Year I Overall Average would exclude from the
analysis students who withdrew. A limitation in the use of the Chi-Square
test is that for cases with more than one degree of freedom the expected
frequency should be greater than or equal to five in at least 80 per cent
of the cells (Runyon and Haber, 1972: 253).

The second problem was to determine whether there was a significant
difference in the value of the Admission Average as a predictor of the
University Year I Overall Weighted Average for students admitted to the
University in 1974 and 1969 and completed Grade 13 at the first attempt.
Khan and Rickard (1971b) derived Pearson Product Moment Correlation
coefficients by faculty and sex for the Year I average with the Admission
Average. The corresponding correlation coefficients were computed for

subjects in the 1974 group, and a Z-score was computed for each pair
of coefficients to test whether there is a significant difference between
the correlations for the 1974 and 1969 groups.

The third problem was to determine whether the following variables
may be used to increase the probability of selecting students from among
the applicants who will succeed academically in Year I programmes of the
University:

the sex of the student;

the age of the student at the time of entry to the University;

the number of credits gained in Grade 13 Mathematics; and

whether the student has passed Grade 13 English.

It has been suggested above that in seeking to implement a
"minimum loss" strategy one may wish to investigate particularly the
records of students whose performance is most likely to be marginal; from
previous research findings these might be expected to be students who have
Admission Averages only slightly in excess of that required for admission.
For this study the marginal students were drawn from those who completed
Grade 13 at the first attempt. They had Admissions Averages equal to or
higher than the minimum required, but less than an average specified for
each faculty, and approximated the lowest quartile of students in each
faculty ranked on the basis of Admission Averages. This procedure is
similar to that used by Boronkay and Bradley (1973), who set hypothetical
admission requirements in their work on proportional analysis. The
categorical criterion variable, Results of Session, was used to permit
the inclusion in the analysis of students who withdrew. The performance
in university of the lowest quartile and of the top three quartiles on
the basis of admission average were tested for significant difference

using the Chi-Square test.

If a significant difference was found to exist in performance, the value of the following variables as predictors for the marginal group were to be investigated: sex, age, credits in Grade 13 Mathematics, and Grade 13 English. Previous research suggested that sex and age might be valuable predictors. During 1975 there was some call for achievement tests in English and Mathematics to be written by all university applicants (Newspaper References). It is for this reason that the variables related to Grade 13 English and Mathematics were included in the study. For the analysis the Chi-Square test was used.

The results of the analysis should provide information for use in evaluating current admission practice at McMaster University. This will be particularly valuable in the case of those admitted on the basis of qualifications other than Grade 13, since all previous studies have been confined to the Grade 13 group. For the Grade 13 group the results should suggest whether there has been a significant change in the predictive ability of the Admission Average which is used as the main criterion in assessing admissibility to Ontario universities. Other predictors were explored for the marginal applicants in an attempt to improve the selection procedure for those faculties which have more applicants than places.

DATA RETRIEVAL

Specifications for the retrieval of data from the Student Data Base were written and appear as APPENDIX C. Programming was undertaken by the Department of Information Systems and Programming of McMaster University.

The records selected from the Student Data Base for creating the

Data File were those of full-time students registered in the 1974-75
Session in Year I degree programmes in the Faculties of Business, Engin-
eering, Humanities, Natural Sciences, and Social Sciences, and the School
of Nursing. Excluded were any students who died.

The output was comprised of

1. the Data File, recorded on magnetic tape,

2. a print-out of the contents of the Data File,

3. a Control Report to identify missing and potentially invalid
   data, and

4. summary reports.

The Data File contained 2889 records, with each record having the
format given in APPENDIX D. The print-out of the contents of the Data
File was used for checking data; the format of the print-out appears in
APPENDIX E.

The Control Report was designed to identify missing or potentially
invalid data, so that they could be checked and corrected. The format of
the Control Report appears in APPENDIX F.

The summary reports were used to describe the profile of the
subjects included in the Data File, and are the subject of further
discussion in the final section of this chapter.

EDITING AND DATA CORRECTION

The specifications for data retrieval included provision for
editing the data, and the results were recorded on the Control Report.
Four hundred and twenty-seven (427) messages were reported and were
distributed as follows:

174   "OVERALL AVERAGE BLANK"

```
155        "ADMISSION AVERAGE BLANK"
 82        "APPLICATION STATUS?" or "APPLICATION CANCELLED"
 13        "BLANK COUNTY CODE"
  1        "BLANK DATE OF BIRTH"
  1        "BLANK MARITAL STATUS"
  1        "RESULT OF SESSION?"
```

The records of the subjects for whom the message "OVERALL AVERAGE

BLANK" were obtained and reviewed. In most cases the student had dropped

one course, but retained full-time status. The specifications were

amended so that the "Weighted Average", calculated on the marks in the

courses taken, would be read. In some cases, such as when the student

had been ill, it was not possible to compute an average.

The Admission Average is calculated by computer for applicants

each year in July. This is not done for applicants whose high school

marks are reported later, nor for applicants who first apply for admission

in late July or August. In both these situations the Admission Average

is calculated, but not added to the Student Data Base; this accounts for

the message "ADMISSION AVERAGE BLANK". In each case the Admission Average

was obtained and added to the Student Data Base.

The specifications provided for the display of "APPLICATION STATUS?"

as an advisory message in any case where it appeared desirable that there

be a further check. The definition of the element Applicant Status for

this study did not correspond to that of an existing data element in the

Student Data Base, so that all cases where there could be ambiguity were

identified by means of this message. The records of the subjects were

reviewed and a code assigned. The record on the Data File was then

amended.

The remaining messages resulted from incomplete information

having been provided by the student at the time of Registration. From

a review of the student's file it was possible to obtain the correct information and to update the Student Data Base.

In addition to the editing provided for in the specifications for retrieval of data, other tests were conducted to ensure that the data were correct. The first was to select the files of twenty-five of the subjects at random, and check all the coded information on the Data File with that contained in the files. No coding errors were found.

The print-out of the contents of the Data File was examined in detail, firstly to ensure that the edit conditions contained in the specifications had been followed, and secondly, to cross-check elements within each record to ensure that the data were consistent. The first check revealed that the conditions had been programmed correctly.

A number of checks for consistency were conducted:

i) where the applicant status indicated that the subject was a mature student, the age at entry should have been at least twenty-one;

ii) applicants entering from Ontario secondary schools should have an Admission Average, whereas those entering from other provinces and countries should not. Applicant status was, therefore, checked with Admission Average;

iii) Mathematics Grade 13 Mark and Number of Grade 13 Mathematics Credits were compared, since there should have been a mark whenever the latter was not equal to zero, and no mark whenever it was equal to zero.

iv) Student Numbers are assigned at the University at the time of first application and the first two digits specify the year of application. The Applicant Status and Student Number were compared to ensure

that all those coded as Repeating Year had Student Numbers with prefixes other than "74".

These checks revealed that the data were consistent, except for those with Student Numbers prefixed by digits other than "74". For a few students in one faculty repeating Year I one section of the Registration Form either had not been completed or had been completed incorrectly. In such cases the Student Data Base was corrected. In other cases an examination of the subject's file revealed that he or she had sought admission in an earlier year, but had deferred entry for at least one year. The coding on the Student Data Base was correct, but for the purpose of this study was not. Such cases were corrected by recoding and amending the Data File.

Among the students repeating Year I were three who were taking a mixture of Year I and Year II courses. These three were deleted from the Data File.

After all the errors were identified, the Student Data Base was updated with the corrections and the retrieval program was rerun. The changes that had to be made directly on the Data File were then made to provide a corrected Data File for use in the studies.

PROFILE OF SUBJECTS

Part of the output from the data retrieval program was a report which gave the profile of the subjects. Tables were produced by Year I programme for the following elements: Age at Entry, Sex, Marital Status, Applicant Status, McMaster Choice, High School Principal's Rating, Number of Grade 13 Mathematics Credits, and Results of Session.

The distribution by Age at Entry is displayed in Table 1.

TABLE 1

DISTRIBUTION OF SUBJECTS BY AGE
AT ENTRY AND FACULTY

Faculty	Age at Entry							
	15	16	17	18	19	20	Over 20	Total
Business	-	1	15	128	176	61	47	428
Engineering	-	1	15	91	111	37	29	284
Humanities	-	-	24	110	129	28	47	338
Nursing	-	-	4	30	26	8	5	73
Science	1	2	60	261	261	66	40	691
Social Sciences	-	-	38	296	387	158	193	1072
Totals	1	4	156	916	1090	358	361	2886

The distributions by Sex and by Marital Status are displayed in Table 2.

TABLE 2

DISTRIBUTION OF SUBJECTS BY SEX AND
MARITAL STATUS BY FACULTY

Faculty	Sex		Marital Status	
	Male	Female	Single	Married
Business	348	80	418	10
Engineering	270	14	278	6
Humanities	92	246	319	19
Nursing	3	70	68	5
Science	439	252	676	15
Social Sciences	495	577	994	78
Totals	1647	1239	2753	133

Of the subjects 57.1 per cent were male and 42.9 per cent were female; 95.4 per cent were single and 4.6 per cent were married.

The distribution by Applicant Status is displayed in Table 3. Of the 2886 students in Year I, 141 were repeating Year I and 2745 were new students. Those admitted from Ontario secondary schools comprised 2390: five from Grade 12, 2311 following a single year in Grade 13, and seventy-four following more than one year in Grade 13.

Among the new students fifty-eight transferred from other Ontario

TABLE 3

DISTRIBUTION OF SUBJECTS BY APPLICANT
STATUS AND FACULTY

Applicant Status	Business	Engineering	Humanities	Nursing	Science	Social Sciences	Total
Grade 12+2	1	1	1	-	-	2	5
Grade 13 completed in 1973-74 at first attempt	255	172	212	42	403	605	1689
Others completing Grade 13 at first attempt	83	44	62	18	205	210	622
Multiple attempts Grade 13 completed 1974	6	5	4	-	-	11	26
Multiple attempts Grade 13 completed before 1974	12	2	2	-	6	26	48
Preliminary Year at Ontario universities	-	-	-	-	2	1	3
CAATS	7	2	4	-	2	18	33
Transfer from other universities	2	5	2	6	2	5	22
Mature students	12	-	22	1	3	102	140
Other provinces	7	5	2	-	4	6	24
USA qualifications	4	2	1	-	3	7	17
GCE	24	23	5	-	25	13	90
Other foreign	4	9	4	-	5	4	26
Repeaters	11	14	17	6	31	62	141

post-secondary institutions: three following a preliminary year at
Ontario Universities, thirty-three from CAATS, and twenty-two from
other universities. Of the others with Canadian qualifications one
hundred and forty entered as mature students and twenty-four from
other provinces. Those with foreign qualifications included seventeen
from the U.S.A., ninety with General Certificate of Education qualifi-
cations, and twenty-six with other foreign qualifications.

The distribution by McMaster Choice (first, second, and third
choice) appears in Table 4.

TABLE 4

DISTRIBUTION OF SUBJECTS BY McMASTER
CHOICE AND FACULTY

Faculty	Choice			
	First	Second	Third	Not Specified
Business	278	82	41	27
Engineering	179	52	40	13
Humanities	209	60	40	29
Nursing	47	16	5	5
Science	386	190	92	23
Social Sciences	682	172	116	102

The distribution by High School Principal's Rating showed that
for 2834 of the 2889 subjects, no rating was recorded. In 1974 a coded
rating was not requested; the fifty-five ratings available were for those
who had applied in an earlier year.

Applicants for admission to the Faculties of Engineering and Science must present at least two credits and one credit respectively of Grade 13 Mathematics. For those seeking entry to the Faculty of Business in 1976 at least one credit of Grade 13 Mathematics is required. The distribution of subjects admitted from Ontario Grade 13 by the number of credits in Grade 13 Mathematics is given in Table 5.

TABLE 5

GRADE 13 CREDITS IN MATHEMATICS OBTAINED BY
SUBJECTS IN THE FACULTIES OF BUSINESS,
ENGINEERING, AND SCIENCE

Grade 13 Mathematics	Business	Engineering	Science
No credits	28	-	-
1 credit	78	-	26
2 credits	144	19	282
3 credits	88	197	300

The distribution by first-year University Results of Session appears in Table 6. Of the 2886 subjects 169 were placed on the Dean's Honours List, 1793 were clear to continue, 462 had an incomplete Year, 240 failed their Year, and 222 withdrew during the Year.

SUMMARY

The chapter commenced with a description of the methodology employed in this study. This was followed by a discussion of the techniques used for the retrieval, editing, and correction of the data.

TABLE 6

DISTRIBUTION OF SUBJECTS BY RESULTS OF
SESSION AND FACULTY

Results of Session	Business	Engineering	Humanities	Nursing	Science	Social Sciences	Total
Deans' Honour List	13	31	23	1	76	25	169
Clear to Continue in Programme	239	158	227	65	416	688	1793
Incomplete Year	114	46	52	7	56	187	462
Failed Year	39	24	16	0	69	92	240
Withdrew	23	25	20	0	74	80	222

The chapter was concluded with a report on the distribution of the subjects by Age at Entry, Sex, Marital Status, Applicant Status, McMaster Choice, High School Principal's Rating, Number of Grade 13 Mathematics Credits, and Results of Session.

Chapter IV

HYPOTHESES AND DATA ANALYSIS

In Chapter I it was reported that for the 1975-76 Session the
University had more qualified applicants than there were places in a
number of programmes, and that it appeared that from 1976 onward admis-
sion to many, if not all, Year I programmes would be by selection. For
Ontario secondary school applicants the only measures of achievement
available were the high school marks assigned by many teachers in dif-
ferent schools.

The last extensive admission studies were conducted in 1970,
following which Boronkay and Bradley (1972) had written:

> . . . there is a feeling among some that the value of the Grade
> 13 marks (either interim or final) as a predictor will deteri-
> orate. Certainly, with the trend towards less precise marking
> standards, and the omission of failing grades from the school
> record, there is nothing to indicate an increase in the predic-
> tive value of school marks. Furthermore, even though the
> expected increase in the demand for university places has
> not yet materialized, the possibility still exists that in
> the future places in university may not expand at the same
> rate as the number of applicants and, therefore, selection will
> become of considerable importance (Boronkay and Bradley, 1972).

In 1975, Oksanen and Spencer (1975b) reported that their findings
appeared to be inconsistent with the expectation noted by Boronkay and
Bradley that the value of the admission average as a predictor would
deteriorate.

This chapter is comprised of three parts, which are devoted to
presenting hypotheses and the data analysis techniques.   The

first section is concerned with the academic performance at the University of the subjects in each of the groups defined by Applicant Status in Element #8; the second, with the value of the Admission Average as a predictor of university performance; and the third, with the value of selected variables as predictors, particularly for the marginal applicant.

ACADEMIC PERFORMANCE OF SUBJECTS GROUPED BY APPLICANT STATUS

For the description of academic performance at the University the Results of Session were used.   These are presented in five categories, as follows: Deans' Honours, Clear to Continue in the Programme, Incomplete Year, Failed Year, and Withdrew during Session.

It was noted above (page 13) that the performance of students may be expected to vary among university programmes, and so the description of academic performance is presented by programme where this is appropriate. However, the number of subjects in some of the Applicant Status categories is too small to present the information meaningfully for each programme.

The Results of Session are presented by programme for the following Applicant Status categories:

Students who completed Grade 13 at the first attempt in
  the school year preceding entry to the University;
Other students who completed Grade 13 at the
  first attempt;
Students who completed Ontario Grade 13 in earlier year with
  multiple attempts;
Mature students; and
Those admitted with General Certificate of Education
  qualifications.

Where the total number of subjects in an Applicant Status category is less than forty, the Results of Session are reported for all

Year I programmes combined. These categories are as follows:

>   Students who completed Ontario Grade 13 with
>   multiple attempts in year of admission;
>   Transfers from other universities;
>   Those admitted from colleges of applied arts and technology;
>   Those admitted with qualifications from other provinces;
>   Those admitted with qualifications gained in the U.S.A.; and
>   Those admitted with foreign qualifications (other than
>   General Certificate of Education and those obtained
>   in the U.S.A.).

The following categories were too small to present a meaningful description of the academic performance of the subjects:

>   Those admitted from Ontario Grade 12; and
>   Those admitted following a Preliminary Year completed
>   at an Ontario university.

Of the 2886 subjects included in this study, 1689 completed Grade 13 at the first attempt in the school year prior to their entering the University in 1974. This may be regarded as the "normal" admission. Other applicants are asked to present qualifications which are deemed the equivalent of those possessed by this group of applicants to gain admission. Inter alia admission requirements are specified to ensure that those admitted stand a reasonable change of success in their university studies. If the qualifications required of other applicants are the equivalent of those required of the "normal" applicants, and if admission requirements serve the purpose articulated above, it may be expected that there will be no significant difference in the performance of the "normal" applicants and of each of the other categories of applicants.

Hypothesis 1:

There is no significant difference in the academic performance

at the University of subjects in each of the applicant

categories and those who completed Grade 13 at the first

attempt in the school year prior to their entering
the University in 1974.

Results of Session were used as the measure of academic
performance. For testing this and other hypotheses presented later
three categories were used: the categories of Deans' Honours and
Clear to Continue in the Programme were combined to form a single
category, "Clear"; the category "Incomplete Year" remained as a single
category; and the categories Failed Year and Withdrew during Session
were combined to form a single category, "Failed".

The hypothesis was tested by means of a Chi-Square test at
the .05 level of significance.

ADMISSION AVERAGE AS A PREDICTOR
OF UNIVERSITY PERFORMANCE

It was noted above that Boronkay and Bradley had suggested that
the value of high school average as a predictor might be expected to
decline, whereas Oksanen and Spencer's later findings suggested that this
had not happened (Page 53). Most previous research has found some measure
of high school academic achievement to be the best single predictor of
first-year university performance, and admission to Ontario universities
is based primarily on the marks attained by applicants in high schools.
There is no reason to suggest that significant changes have occurred in
the five-year period from 1969 to 1974.

Hypothesis 2:

There is no significant difference in the predictive value
of the Admission Average for those admitted in 1974 from

that for those admitted in 1969.

The results reportèd by Khan and Rickard (1971b) were used for the group admitted in 1969; these results were for subjects divided by programme and sex, whereas those reported by Boronkay (1971a, 1971b, 1971c, 1971d, 1971e) were not differentiated according to sex. Other research, as noted above, has indicated that there may be differences in performance for males and females (Page 30).

Using the first-year University average as the dependent variable, Khan and Rickard calculated the Pearson Product Moment Correlation coefficients for a number of different independent variables for students admitted from Ontario Grade 13 who had spent a single year in that grade. The correlation coefficients for Admission Average and first-year University average reported were as follows: Social Sciences (including Physical Education), males 0.53, females 0.56; Humanities, males 0.47, females 0.67; Science, males 0.59, females 0.77; and Engineering (both sexes), 0.75.

Correlation coefficients were determined for these same groups using the subjects included in this study. The hypothesis was tested at the .05 level, using the test statistic Z, in which

$$Z = \frac{z_r - Z_R}{\sqrt{\dfrac{1}{n - 3}}}$$

where z_r = the transformed value of the sample r (for the 1974 group), and Z_R = the transformed value of the population correlation coefficient specified under H_0 (for the 1969 group).

SELECTION PROCEDURES AND THE "MARGINAL ADMITTEE"

When the number of qualified applicants exceeds the number of places in a university programme, one objective in selecting students may be to choose those who have the best chance of performing well academically in their university work, or another may be to minimize the number who fail at or withdraw from the university. For the selection of students multiple correlation techniques have been used extensively, but these assume a linear relationship between the independent variables and the dependent variable. Merwin (1954) demonstrated that the probable accuracy of a predictor and the proportion of successful students is geometric and non-linear, so that the predictive accuracy is greatest at the high and low extremes.

Boronkay and Bradley (1972) suggested the use of Proportional Analysis to improve the selection procedure; they advocated admitting all applicants with an Admission Average in excess of a specified level, and using a combination of predictors for those with a lower Admission Average. The other predictors employed by Boronkay and Bradley are no longer available; the dependent variable was Results of Session. Each of the hypotheses presented in the remainder of this chapter were tested using a Chi-Square test at the .05 level of significance, with Results of Session as the dependent variable; subjects were grouped by Faculty.

Previous studies have consistently suggested that a measure of academic achievement such as the Admission Average is the best single predictor of academic success at university (Weiss, 1970). If one seeks to improve the selection procedures, one might do so by seeking to improve the procedures for those who might be called "marginal applicants".

In this study of the predictive value of various independent

variables, most attention was given to a selected group of admitted
students: those who comprise approximately the lowest quartile of
subjects ranked on the basis of Admission Average who completed Grade
13 at the first attempt. Those with an Admission Average of less than
60.0 per cent (64.0 per cent in Engineering) were excluded, since
that is the minimum average required for admission. Students may have
an Admission Average of less than 60.0 per cent for either one of two
reasons. Firstly, admission is granted on the basis of an interim average,
whereas the Admission Average is calculated using final marks; some
students attain an average in excess of 60.0 per cent based on the
interim marks, but subsequently obtain final marks which are lower.
Secondly, some students have been admitted to the University on an
experimental basis with Admission Averages of less than 60.0 per cent.

Those included in the selected group had an Admission Average
of at least 60.0 per cent (64.0 per cent in Engineering), but less than
that specified, as follows, for each Faculty: Business, 65.0 per cent;
Humanities, 68.0 per cent; Engineering, 72.0 per cent; Science, 70.0 per
cent; and Social Sciences, 65.0 per cent. It may be expected that the
success at the University will be significantly greater for those admitted
who complete Grade 13 at the first attempt with an Admission Average
equal to or in excess of those specified immediately above.

Hypothesis 3:

The performance of subjects in the lowest quartile, as
defined above, is significantly lower than that of those
in the highest three quartiles for students who complete
Grade 13 at the first attempt.

It was proposed that, if this hypothesis were supported by the analysis, further studies of each of these groups would be conducted, and subjects in these groups would be called "marginal admittees."

Social Sciences Experimental Admission

As an experiment, admission to the Faculty of Social Sciences was granted to a number of applicants with Admission Averages of less than 60.0 per cent. This experiment was conducted, since it had been suggested that the University performance of this group would be no worse than that of those with Admission Averages of 60.0 to 65.0 per cent.

Hypothesis 4:

The performance of subjects in the Faculty of Social Sciences with Admission Averages below 60.0 per cent as measured by the Results of Session is not significantly different from that of the "marginal admittees" in the Faculty of Social Sciences.

Sex

It was reported above that the academic achievement and predictability of academic success has differed for males and females (Page 30). Generally, the academic achievement and predictability of academic success have been found to be higher for females.

Hypothesis 5:

The female marginal admittees perform significantly better at the University than the male marginal admittees in each of the faculties.

Age at Entry

Some studies have indicated that Age at Entry may be a valuable predictor (Page 27). It was assumed that the normal age of entry is nineteen.

Hypothesis 6:

Marginal admittees aged eighteen at entry to the University perform at a significantly different academic level from that of those admitted at the age of nineteen in each of the faculties.

Hypothesis 7:

Marginal admittees aged seventeen at entry to the University perform at a significantly different academic level from that of those admitted at nineteen in each of the faculties.

Grade 13 Mathematics

Students may enter the University either with no credits in Grade 13 Mathematics or with up to three credits.

Commencing September 1976, the Faculty of Business will require Grade 13 Mathematics of those to be granted admission. The students registered in the Faculty of Business who were included in this study were not required to present Grade 13 Mathematics. If Grade 13 Mathematics is to be required in the future, it may be expected that it be a valuable predictor.

Hypothesis 8:

The performance of marginal admittees registered in the

Faculty of Business who have Grade 13 credits in Mathematics is significantly better than the performance of those who have no Grade 13 credits in Mathematics.

For entry to the Faculty of Engineering a student must present at least two credits of Mathematics, although many students present three credits. Previous studies have suggested that Mathematics marks are valuable predictors for Engineering programmes (Fleming, 1962; Boronkay, 1971b).

Hypothesis 9:

The academic performance of marginal admittees registered in the Faculty of Engineering who have three credits in Grade 13 Mathematics is significantly better than that of marginal admittees who have two credits in Grade 13 Mathematics.

For entry to the Faculty of Science at least one credit of Grade 13 Mathematics is required. Boronkay reported that the scores in CSAT-M, a test of Mathematical ability, was of some value in prediction for those entering the Faculty of Science (Boronkay, 1971d).

Hypothesis 10:

The performance of marginal admittees registered in the Faculty of Science who have two credits in Grade 13 Mathematics is significantly better than that of marginal admittees who have only one credit of Grade 13 Mathematics.

Hypothesis 11:

The performance of marginal admittees registered in the

Faculty of Science who have three credits of Grade 13
Mathematics is significantly better than that of
marginal admittees with two credits of Grade 13
Mathematics.

Grade 13 English

In the public debate on University admission conducted through the
media, it has been suggested that those seeking to enter universities
should write an achievement test in English (Newspaper References). One
might infer that the proponents expect proficiency in English to be a
valuable criterion for selecting students for admission, and perhaps,
therefore, a predictor of future academic success. Freshmen entering four
Ontario universities in the fall of 1975 were required to write English
Language Achievement Tests; no such tests were written by the students
included in this study, but the results in Grade 13 English are recorded
for those who passed the course.

Hypothesis 12:
The academic performance of marginal admittees in each
of the faculties who have passed an English Grade 13
course is significantly better than that of marginal
admittees who have not passed a Grade 13 English course.

General Certificate of Education

An increasing number of applicants have been admitted to the
University on the basis of GCE qualifications. Many of these applicants
have been admitted to the Faculties of Business, Engineering and Science.
Baker (1975) reported that students admitted with these qualifications to

a university in the United States performed well.

Hypothesis 13:

The performance of students admitted with GCE qualifi-
cations in the Faculties of Business, Engineering and
Science is significantly better than that of marginal
admittees in each of these faculties.

Mature Students

Since 1962 the University has admitted mature students who do not
possess the normal academic qualifications required for admission to the
University. Most of these students have registered in the Faculties of
Humanities and Social Sciences. Many previous studies suggest that
mature students may be expected to perform at about the same level as
normally admitted students (Page 27ff).

Hypothesis 14:

There is no significant difference in the academic
performance of mature students in the Faculties
of Humanities and Social Sciences and that of
marginal admittees in those faculties.

SUMMARY

The hypotheses presented in this chapter were designed to provide
information which is pertinent to the research problems identified in
Chapter I. The first hypothesis related to the investigation of the
academic performance of groups of students admitted on the basis of
diverse qualifications, and the second to the comparative value of the

Admissions Average as a predictor of university performance for students admitted in 1974 and 1969. The remaining hypotheses are related to the prediction of academic performance for students admitted with Admission Averages marginally above the minimum specified for an applicant to gain admission.

Chapter V

RESULTS

For the description of academic performance at the University
of the subjects the Results of Session were used. They were presented
in five categories: Deans' Honours, Clear to Continue in the Programme,
Incomplete Year, Failed Year, and Withdrew during Session.

For the purposes of analysis the categories Deans' Honours and
Clear to Continue in the Programme were combined to form a single
category "Clear"; the categories Failed Year and Withdrew during Session
were combined to form a single category "Failed".

The admission requirements of the University specify the Grade 13
subjects and minimum average that an applicant must present to be consi-
dered for admission. The "normal applicant" was defined as one who
completed Grade 13 at the first attempt in the school year immediately
preceding entry to McMaster University. The performance of students
grouped on the basis of admission qualifications was compared to that of
the normal applicants in each faculty; the Chi-Square test was used for
the analysis.

The Grade 13 Admission Average has been employed in the selection
process as a predictor of first-year university academic performance.
Khan and Rickard (1971b) determined Pearson Product Moment Correlation
coefficients for university Year I overall average with Admission Average
for subjects grouped by faculty and sex who completed Grade 13 at the

66

first attempt and entered the University in 1969. In this study coefficients were computed for the same groups of subjects who registered for the first time in 1974; the difference in the coefficients for each group was tested for significance using the test statistic Z.

Students in each faculty who completed Grade 13 at the first attempt and were placed in the lowest quartile on the basis of Admission Average were identified. The academic performance of this group and of those with higher Admission Averages were compared using Results of Session as the measure of performance; for the analysis the Chi-Square test was used. The academic performance of those in the lowest quartile, the "marginal admittees", was examined further. Marginal admittees were grouped in turn on the basis of sex, age at entry, number of credits in Grade 13 Mathematics, and whether the student had passed Grade 13 English; the academic performance of the sub-groups was compared. The Chi-Square test was employed for the analysis, and Results of Session used as the dependent variable.

ACADEMIC PERFORMANCE OF SUBJECTS GROUPED BY FACULTY AND APPLICANT STATUS

The performance of the following groups of subjects is reported by the University faculty in which the subjects were registered:

> Students who completed Grade 13 at the first attempt
> in the school year preceding entry to the University
> (the "normal applicants");
> Other students who completed Grade 13 at the first
> attempt;
> Students who completed Ontario Grade 13 in earlier
> year with multiple attempts;
> Mature students; and
> Those admitted with General Certificate of Education
> qualifications.

Hypothesis 1:

There is no significant difference in the academic performance at the University of subjects in each of the applicant categories and of those who completed Grade 13 at the first attempt in the school year prior to their entering the University in 1974.

This hypothesis was tested using the Chi-Square test with two degrees of freedom, for which the critical value is 5.99 at the .05 level of significance.

Results for subjects in the Faculty of Business appear in Table 7.

TABLE 7

ANALYSIS OF RESULTS OF SESSION BY APPLICANT
STATUS FOR THE FACULTY OF BUSINESS

Applicant Status	Results of Session			χ^2
	Clear	Incomplete	Failed	
"Normal applicants"	155	66	34	N/A
Others completing Grade 13 at first attempt	46	21	16	1.81
Multiple attempts at Grade 13	5	6	1	-
Mature students	4	6	2	-
GCE qualifications	21	2	1	6.72

df = 2; χ^2crit = 5.99

For the comparison of academic performance with that of the normal applicants, the values of x^2 were not calculated for the Mature Student group nor for those who had multiple attempts at Grade 13, since the expected frequencies were five or more in fewer that 80 per cent of the cells (Runyon and Haber, 1972: 253).

In the comparison of academic performance of normal applicants and other subjects who completed Grade 13 at the first attempt, the value of x^2 was 1.81, which was less than the critical value at the .05 level of significance; the Null Hypothesis was not rejected.

From this test it is concluded that there is no significant difference in the Year I academic performance in the Faculty of Business of normal applicants and of others who completed Grade 13 at the first attempt.

The value of x^2 for the comparison of those with GCE qualifications with the normal applicants, 6.72, exceeded the critical value; the Null Hypothesis was rejected.

It is concluded that there is a significant difference in the Year I academic performance of those admitted to the Faculty of Business with GCE qualifications and of the normal applicants.

Results for subjects in the Faculty of Engineering are displayed in Table 8.

The value of x^2 was calculated only for the comparison of the normal applicants and others who completed Grade 13 at the first attempt; in the other cases the expected frequency was five or more in fewer than 80 per cent of the cells. The value of x^2 calculated, 1.61, was less than the critical value; therefore, the Null Hypothesis was not rejected.

The conclusion reached is that there is no significant difference

TABLE 8

ANALYSIS OF RESULTS OF SESSION BY APPLICANT
STATUS FOR THE FACULTY OF ENGINEERING

Applicant Status	Results of Session			χ^2
	Clear	Incomplete	Failed	
"Normal applicants"	113	31	28	N/A
Others completing Grade 13 at first attempt	26	7	11	1.61
Multiple attempts at Grade 13	-	-	2	-
GCE qualifications	22	1	-	-

df = 2; χ^2Crit = 5.99

in the Year I academic performance in the Faculty of Engineering of the normal applicants and of others who completed Grade 13 at the first attempt.

Results for subjects in the Faculty of Humanities are summarized in Table 9.

TABLE 9

ANALYSIS OF RESULTS OF SESSION BY APPLICANT
STATUS FOR THE FACULTY OF HUMANITIES

Applicant Status	Results of Session			χ^2
	Clear	Incomplete	Failed	
"Normal applicants"	174	25	13	N/A
Others completing Grade 13 at first attempt	37	13	12	15.21
Multiple attempts at Grade 13	1	-	1	-
Mature students	12	3	7	-
GCE qualifications	3	2	-	-

df = 2; χ^2crit = 5.99

The value of χ^2 was calculated only for subjects who completed Grade 13 at the first attempt; for the other groups the expected frequencies were five or more in fewer than 80 per cent of the cells.

In the comparison of the normal applicants and others who completed Grade 13 at the first attempt, the value of χ^2, 15.21, was greater than the critical value at the .05 level of significance. The Null

Hypothesis was rejected, and it is concluded that there is a significant difference in the academic performance in the Faculty of Humanities of the normal applicants and of others who completed Grade 13 at the first attempt.

Results for subjects in the Faculty of Science appear in Table 10.

TABLE 10

ANALYSIS OF RESULTS OF SESSION BY APPLICANT
STATUS FOR THE FACULTY OF SCIENCE

Applicant Status	Results of Session			x^2
	Clear	Incomplete	Failed	
"Normal applicants"	279	30	94	N/A
Others completing Grade 13 at first attempt	157	17	31	5.60
Multiple attempts at Grade 13	1	1	4	-
Mature students	1	1	1	-
GCE qualifications	22	1	2	4.32

df = 2; x^2crit = 5.99

The value of x^2 was not calculated for those who had more than one attempt at Grade 13, nor for Mature Students since the expected frequencies were five or more in fewer than 80 per cent of the cells.

In the comparison with the normal applicants in the Faculty of Science, the values of x^2 for others who completed Grade 13 at the first attempt, and for those with GCE qualifications were 5.60 and 4.32 respec-

tively; these values were less than the critical value. The Null Hypothesis was not rejected in either case.

The results indicate that there is no significant difference in the Year I academic performance in the Faculty of Science of normal applicants and of others who completed Grade 13 at the first attempt. There is also no significant difference in the academic performance in the Faculty of Science of students admitted with GCE qualifications and of normal applicants.

Results for students in the Faculty of Social Sciences are summarized in Table 11.

TABLE 11

ANALYSIS OF RESULTS OF SESSION BY APPLICANT
STATUS FOR THE FACULTY OF SOCIAL SCIENCES

Applicant Status	Results of Session			χ^2
	Clear	Incomplete	Failed	
"Normal applicants"	415	107	83	N/A
Others completing Grade 13 at first attempt	150	31	29	0.97
Multiple attempts at Grade 13	12	7	7	-
Mature students	58	18	26	9.63
GCE qualifications	13	-	-	-

df = 2; χ^2crit = 5.99

The value of x^2 was not calculated for those admitted on the basis of GCE qualifications, nor for those who spent more than one year in Grade 13, since the expected frequencies were five or more in fewer than 80 per cent of the cells.

In the comparison of the normal applicants and others who completed Grade 13 at the first attempt in the Faculty of Social Sciences, the value of x^2, 0.97, was less than the critical value. The Null Hypothesis was not rejected. It is concluded that there is no significant difference in the Year I academic performance in the Faculty of Social Sciences of normal applicants and other students who completed Grade 13 at the first attempt.

For comparison of the Mature students and the normal applicants in the Faculty of Social Sciences, the value of x^2, 9.63, exceeded the critical value. The conclusion reached was that the performance of Mature students in the Faculty of Social Sciences was significantly different at the .05 level from that of subjects who completed Grade 13 at the first attempt in the school year preceding entry to the University.

The "normal applicant" was defined as the student who completed Grade 13 at the first attempt with all Grade 13 taken in the year immediately preceding entry to the University. Only in the Faculty of Humanities was there a significant difference in the performance of the normal applicants and of other students who completed Grade 13 at the first attempt. In that faculty the normal applicants performed better than others who completed Grade 13 at the first attempt.

In no faculty was it possible to conduct the analysis for the comparison of the academic performance of those who attempted Grade 13 subjects on more than one occasion and of the normal applicants. However,

it appeared that the normal applicants had a tendency to perform at a higher level. Only for subjects in the Faculty of Social Sciences was the analysis possible for mature students; the mature students did not perform as well as the normal applicants. Although the analysis could not be conducted for subjects in the Faculty of Humanities, it appears that the mature students in that faculty did not perform as well as the normal applicants.

The performance of those admitted on the basis of GCE qualifications appeared to be superior to that of the normal applicants: in the Faculty of Business the difference was statistically significant; for the Faculty of Science the difference was approaching significance at the .05 level; the analysis could not be conducted for subjects in the Faculties of Engineering and Social Sciences, but the performance of those with GCE qualifications was clearly superior, and in the Faculty of Humanities no conclusions could be drawn.

ACADEMIC PERFORMANCE OF SUBJECTS GROUPED BY APPLICANT STATUS

The performance of the following groups of subjects is reported for all University faculties combined:

> Students who completed Ontario Grade 13 with multiple attempts in year of admission;
> Transfers from other universities;
> Those admitted from college of applied arts and technology (CAAT);
> Those admitted with qualifications from other provinces;
> Those admitted with qualifications gained in the U.S.A.;
> Those admitted with foreign qualifications (other than GCE and those obtained in the U.S.A.).

The performance of these groups is summarized in Table 12.

It was not possible to conduct a statistical analysis of the results because of the small number of subjects in each of the groups.

TABLE 12

PERFORMANCE OF SUBJECTS GROUPED
BY APPLICANT STATUS

Applicant Status	Results of Session				
	Deans' Honours	Clear	Incomplete	Failed Year	Withdrew
Multiple attempts at Grade 13, completed in 1974	–	16 (61%)	9 (35%)	–	1 (4%)
CAAT	1 (3%)	18 (55%)	7 (21%)	3 (9%)	4 (12%)
Transfers from Universities	1 (4%)	16 (73%)	2 (9%)	3 (14%)	–
Other Provinces	–	10 (41%)	5 (21%)	4 (17%)	5 (21%)
U.S.A.	3 (17%)	9 (53%)	2 (12%)	1 (6%)	2 (12%)
Other Foreign (except GCE, USA)	–	14 (54%)	6 (23%)	4 (15%)	2 (8%)

However, it appears that those who transferred from other universities
and those with qualifications from the U.S.A. perform at a level similar
to that of the normal applicants. Those admitted from other provinces
and other countries appear to perform at a lower level. Results for
those admitted from colleges of applied arts and technology and those
who completed Grade 13 in 1974 with multiple attempts are inconclusive.

COMPARISON OF PREDICTIVE VALUE OF HIGH SCHOOL MARKS: 1969 AND 1974

Hypothesis 2:

There is no significant difference in the predictive
value of the Admission Average for those admitted in
1974 from that for those admitted in 1969.

Pearson Product Moment Correlation coefficients for first-Year
Overall Average with Admission Average were calculated for each faculty
by sex, except in the case of the Faculty of Engineering for which a
single coefficient for both sexes was calculated. The results reported
by Khan and Rickard were used for the 1969 group (Khan and Richard, 1971b).

The Hypothesis was tested by converting the correlation coeffi-
cients to z-scores, and using the test statistic Z, in which

$$Z = \frac{z_r - z_R}{\sqrt{\frac{1}{n-3}}}$$

where z_r = the transformed value of the sample (for the 1974 group) and
z_R = the transformed value of the population correlation coefficient
specified under H_o (for the 1969 group).

The results are summarized in Table 13.

TABLE 13

CORRELATION OF FIRST-YEAR UNIVERSITY
AVERAGE WITH ADMISSION AVERAGE

		Pearson Correlation Coefficients			
Groups		1969	1974	n	Z
Business	- Males	-	0.51	264	-
	- Females	-	0.73	53	-
Engineering	- Both sexes	0.75	0.69	197	-1.74
Humanities	- Males	0.47	0.57	58	0.91
	- Females	0.67	0.59	198	-1.86
Science	- Males	0.59	0.76	331	5.76
	- Females	0.77	0.76	210	0.35
Social Sciences	- Males	0.53	0.54	316	0.25
	- Females	0.56	0.57	440	0.31

Z crit $= \pm 1.96$ (two-tailed)

The critical value of z at the .05 level of significance for a two-tailed test is ±1.96. Only in the case of males in the Faculty of Science does the value of the statistic Z exceed the critical value. Therefore, the Null Hypothesis is not rejected, except in the case of the males in the Faculty of Science; there is a significant difference at the .05 level in the predictive value of the Admission Average for males entering the Faculty of Science in 1974 from that for males entering the Faculty of Science in 1969.

PERFORMANCE OF STUDENTS WITH
LOW ADMISSION AVERAGES

Hypothesis 3:

The performance of subjects in the lowest quartile
is not significantly different from that of those in
the highest three quartiles for students who complete
Grade 13 at the first attempt.

The Null Hypothesis was tested using the Chi-Square test at the .05 level with two degrees of freedom.

For each faculty the subjects who completed Grade 13 at the first attempt were divided into two groups. One group was comprised of approximately the lowest quartile of those who met the Admission Requirements having an Admission Average of at least 60.0 per cent; the other group, of approximately the top three quartiles. In practice the former group was greater than a quartile, as the groups were defined on the basis of Admission Average and were divided at levels that were similar to the dividing points used by Boronkay and Bradley (1972) for their work on Proportional Analysis, and that might be similar to the standards to be

required for early admission by those faculties to which entry may be restricted.

The results for each Faculty are summarized below in Table 14.

TABLE 14

COMPARISON OF UNIVERSITY PERFORMANCES FOR
SUBJECTS WITH LOW AND WITH HIGH
ADMISSION AVERAGES

| Faculty | Admission Average=A | Results of Session | | | χ^2 |
		Clear	Incomplete	Failed	
Business	$A \geqslant 65.0$	154	41	17	
	$60.0 \leqslant A < 65.0$	50	38	32	43.76
Engineering	$A \geqslant 72.0$	119	14	18	
	$64.0 \leqslant A < 72.0$	18	22	19	44.50
Humanities	$A \geqslant 68.0$	164	12	15	
	$60.0 \leqslant A < 68.0$	47	26	10	33.68
Science	$A \geqslant 70.0$	358	18	46	
	$60.0 \leqslant A < 70.0$	77	29	77	261.50
Social Sciences	$A \geqslant 65.0$	409	58	39	
	$60.0 \leqslant A < 65.0$	121	46	43	43.08

df = 2; χ^2crit = 5.99

The values of χ^2 shown in Table 14 all exceed the critical value at the .05 level of significance; the Null Hypothesis was rejected in each case.

In the Faculties of Business, Engineering, Humanities, Science, and Social Sciences the performance of those in approximately the lowest

quartile among subjects who completed Grade 13 at the first attempt
is significantly lower than that of those in the highest three quartiles.

SOCIAL SCIENCES EXPERIMENTAL ADMISSION

Hypothesis 4:

The performance of subjects in the Faculty of Social
Sciences with Admission Averages below 60.0% as
measured by Results of Session is not significantly
different from that of marginal admittees in the
Faculty of Social Sciences.

The Hypothesis was tested using the Chi-Square test at the .05
level with two degrees of freedom.

The results are summarized in Table 15 below.

TABLE 15

ACADEMIC PERFORMANCE IN THE FACULTY OF
SOCIAL SCIENCES OF STUDENTS ADMITTED
ON AN EXPERIMENTAL BASIS

| Admission Average (A) | Results of Session | | | x^2 |
	Clear	Incomplete	Failed	
$A < 60.0$	34	34	30	
$60 \leqslant A < 65.0$	121	46	43	13.38

df = 2; x^2crit = 5.99

The value of x^2, 13.38, exceeded the critical value at the .05
level of significance; the Null Hypothesis was rejected.

The conclusion is that there is a significant difference in the

performance of subjects in the Faculty of Social Sciences with Admission

Averages of less than 60.0 per cent, and that of subjects with Admission

Averages in the range 60.0 to 65.0 per cent.

PERFORMANCE OF MARGINAL ADMITTEES
DIVIDED BY SEX

Hypothesis 5:

There is no significant difference in the

performance of male and female marginal

admittees in each of the faculties.

The Null Hypothesis was tested using the Chi-Square test at the

.05 level with two degrees of freedom; the Results appear in Table 16.

The values of x^2 were not calculated for subjects in the Faculties

of Business and Engineering, since the expected frequencies were five or

more in fewer than 80 per cent of the cells.

For each of the Faculties of Humanities, Science, and Social

Sciences the value of x^2 was less than the critical value at the .05 level;

the Null Hypothesis was not rejected. The results of the analysis indicate

that there is no significant difference at the .05 level in first-year

University academic performance of male and female marginal admittees in

the Faculties of Humanities, Science, and Social Sciences.

PERFORMANCE OF MARGINAL ADMITTEES
DIVIDED BY AGE

Hypothesis 6:

Marginal admittees aged eighteen at entry to the Univ-

ersity do not perform at a significantly different

academic level from that of those admitted at the age of

TABLE 16

PERFORMANCE OF MARGINAL ADMITTEES
DIVIDED BY SEX

Faculty	Group	Results of Session			χ^2
		Clear	Incomplete	Failed	
Business	- Male	39	36	30	
	- Female	1	2	2	-
Engineering	- Male	16	22	19	
	- Female	2	-	-	-
Humanities	- Male	13	7	4	
	- Female	34	19	6	0.66
Science	- Male	55	18	56	
	- Female	22	11	21	1.21
Social Sciences	- Male	61	20	27	
	- Female	60	26	16	3.43

df = 2; χ^2crit = 5.99

nineteen in each of the faculties.

Hypothesis 6 was tested using the Chi-Square test at the .05 level; the results appear in Table 17.

TABLE 17

PERFORMANCE OF MARGINAL ADMITTEES OF
AGE 18 AND AGE 19

| Faculty | Group | Results of Session | | | x^2 |
		Clear	Incomplete	Failed	
Business	- Age 18	8	9	11	
	- Age 19	20	17	13	1.70
Engineering	- Age 18	4	7	3	
	- Age 19	12	11	10	-
Humanities	- Age 18	12	5	3	
	- Age 19	28	16	5	0.58
Science	- Age 18	26	16	21	
	- Age 19	36	8	32	5.40
Social Sciences	- Age 18	33	10	8	
	- Age 19	58	24	21	1.02

df = 2; x^2crit = 5.99

A value of x^2 was not calculated for subjects in the Faculty of Engineering, since the expected frequencies were five or more in fewer than 80 per cent of the cells. For all other faculties the value of x^2 was less than the critical value at the .05 level; the Null Hypothesis was not rejected.

There is no significant difference at the .05 level in first-Year University academic performance of marginal admittees admitted at age eighteen and those admitted at age nineteen to the Faculties of Business, Humanities, Science, and Social Sciences.

Hypothesis 7:

Marginal admittees aged seventeen at entry to the University do not perform at a significantly different academic level from that of those admitted at age nineteen in each of the faculties.

Of the twenty-one marginal admittees aged seventeen, thirteen were in the Faculty of Science; only the results for the Faculty of Science are presented and they appear in Table 18.

TABLE 18

PERFORMANCE OF MARGINAL ADMITTEES IN
THE FACULTY OF SCIENCE OF
AGE 17 AND AGE 18

| Group | Results of Session | | | x^2 |
	Clear	Incomplete	Failed	
Science - Age 17	5	2	6	
- Age 19	36	8	32	0.47

df = 2; x^2crit = 5.99

The value of x^2 was less than the critical value at the .05 level. The Null Hypothesis was not rejected; there is no significant difference at the .05 level in first-year University academic performance

of marginal admittees in the Faculty of Science admitted at age
seventeen and of those admitted at age nineteen.

PERFORMANCE OF MARGINAL ADMITTEES DIVIDED BY CREDITS IN GRADE 13 MATHEMATICS

Hypothesis 8:

The performance of marginal admittees registered in
the Faculty of Business who have Grade 13 credits in
Mathematics is not significantly different from the
performance of those who have no Grade 13 credits in
Mathematics.

The results are given in Table 19.

TABLE 19

PERFORMANCE OF MARGINAL ADMITTEES IN THE FACULTY OF BUSINESS DIVIDED BY CREDITS IN GRADE 13 MATHEMATICS

Group	Results of Session		
	Clear	Incomplete	Failed
No credits in Grade 13 Mathematics	3	8	3
Credits in Grade 13 Mathematics	37	30	29

Since the expected frequencies were five or more in fewer than
80 per cent of the cells, it was not possible to test the Hypothesis.

Hypothesis 9:

The academic performance of marginal students registered

in the Faculty of Engineering who have three credits
in Grade 13 Mathematics is not significantly different
from that of marginal admittees who have two credits
in Grade 13 Mathematics.

The results are given in Table 20.

TABLE 20

PERFORMANCE OF MARGINAL ADMITTEES IN THE
FACULTY OF ENGINEERING DIVIDED
BY CREDITS IN GRADE 13
MATHEMATICS

Group	Results of Session		
	Clear	Incomplete	Failed
Two credits in Grade 13 Mathematics	1	4	3
Three credits in Grade 13 Mathematics	17	18	16

Since the expected frequencies are five or more in fewer than 80
per cent of the cells, it was not possible to test the Hypothesis.

Hypothesis 10:

The performance of marginal admittees registered in
the Faculty of Science who have two credits in
Grade 13 Mathematics is not significantly different
from that of marginal admittees who have only one
credit of Grade 13 Mathematics.

Hypothesis 11:

The performance of marginal admittees registered in

the Faculty of Science who have three credits of

Grade 13 Mathematics is not significantly different

from that of marginal admittees with two credits

of Grade 13 Mathematics.

The data for testing these hypotheses are given in Table 21.

TABLE 21

PERFORMANCE OF MARGINAL ADMITTEES IN
THE FACULTY OF SCIENCE DIVIDED
BY CREDITS IN GRADE 13
MATHEMATICS

Group	Results of Session		
	Clear	Incomplete	Failed
One credit in Mathematics	2	2	10
Two credits in Mathematics	50	19	45
Three credits in Mathematics	25	8	22

df = 2; χ^2crit = 5.99

For Hypothesis 10 the value of χ^2 was 5.67, and for Hypothesis 11,

0.12. In both cases the Null Hypothesis was not rejected.

The conclusion is that there is no significant difference in the

first-Year University performance of marginal admittees registered in the

Faculty of Science who have two credits of Grade 13 Mathematics and of

those who have one credit of Grade 13 Mathematics. Furthermore, there

is no significant difference in the first-Year University performance of

marginal admittees registered in the Faculty of Science who have three

credits of Grade 13 Mathematics and of those who have two credits of

Grade 13 Mathematics.

PERFORMANCE OF MARGINAL ADMITTEES DIVIDED
ON THE BASIS OF GRADE 13 ENGLISH

Hypothesis 12:

The academic performance of marginal admittees in each
of the Faculties who have passed an English Grade 13
course is not significantly different from that of
marginal admittees who have not passed a Grade 13
English course.

This Hypothesis was not tested for subjects in the Faculty of
Humanities, since successful completion of Grade 13 English is a require-
ment for admission to that faculty. The results for subjects registered
in other faculties are given in Table 22.

TABLE 22

PERFORMANCE OF MARGINAL ADMITTEES DIVIDED
ON THE BASIS OF GRADE 13 ENGLISH

| Faculty | Group | Results of Session | | | χ^2 |
		Clear	Incomplete	Failed	
Business	Grade 13 English	35	35	30	
	No English	5	3	2	-
Engineering	Grade 13 English	11	14	12	0.03
	No English	7	8	7	
Science	Grade 13 English	58	25	65	2.68
	No English	19	4	12	
Social Sciences	Grade 13 English	102	43	51	-
	No English	8	3	2	

df = 2; χ^2crit = 5.99

It was not possible to test the Hypothesis for subjects registered in the Faculties of Business and Social Sciences, since the expected frequencies were five or more in fewer than 80 per cent of the cells.

The values of x^2 for subjects in the Faculties of Engineering and Science were less than the critical value at the .05 level of significance. The Null Hypothesis was not rejected.

There is, therefore, no significant difference in the first-year University performance of marginal admittees registered in the Faculties of Engineering and Science who have passed an English Grade 13 course and of those who have not passed an English Grade 13 course.

PERFORMANCE OF STUDENTS ADMITTED ON THE BASIS OF GENERAL CERTIFICATE OF EDUCATION QUALIFICATIONS

Hypothesis 13:

The performance of students admitted with GCE

qualifications in the Faculties of Business,

Engineering and Science is not significantly

different from that of marginal admittees in

each of these faculties.

The results are given Table 23.

The values of x^2 for each of the Faculties of Business, Engineering, and Science exceeded the critical value; the Null Hypothesis was rejected. The results of the analysis indicate that there is a significant difference in the first-Year University academic performance of marginal admittees and of those admitted on the basis of GCE qualifications in each of the Faculties of Business, Engineering, and Science.

TABLE 23

PERFORMANCE OF MARGINAL ADMITTEES AND SUBJECTS
ADMITTED ON THE BASIS OF GENERAL
CERTIFICATE OF EDUCATION
QUALIFICATIONS

Faculty	Group	Results of Session			χ^2
		Clear	Incomplete	Failed	
Business	Marginal Admittees	40	38	32	
	GCE	21	2	1	20.81
Engineering	Marginal Admittees	18	22	19	
	GCE	22	1	–	28.21
Science	Marginal Admittees	77	29	77	
	GCE	22	1	2	18.62

df = 2; χ^2crit = 5.99

PERFORMANCE OF MATURE STUDENTS

Hypothesis:14:

There is no significant difference in the academic

performance of Mature students in the Faculties

of Humanities and Social Sciences and that of

marginal admittees in those faculties.

The results are given in Table 24.

TABLE 24

PERFORMANCE OF MARGINAL ADMITTEES
AND MATURE STUDENTS IN THE
FACULTIES OF HUMANITIES
AND SOCIAL SCIENCES

| Faculty | Group | Results of Session | | | x^2 |
		Clear	Incomplete	Failed	
Humanities	Marginal Admittees	47	26	10	
	Mature Students	12	3	7	6.18
Social Sciences	Marginal Admittees	121	46	43	
	Mature Students	58	18	26	1.39

df = 2; x^2crit = 5.99

For the subjects in the Faculty of Humanities the value of x^2,
6.18, exceeded the critical value; the Null Hypothesis was rejected. It
is concluded that there is a significant difference in the performance of
marginal admittees and of mature students in the Faculty of Humanities.

For students in the Faculty of Social Sciences the value of x^2
was less than the critical value; the Null Hypothesis was not rejected.

There is no significant difference in the first-Year University performance of marginal admittees and mature students in the Faculty of Social Sciences.

SUMMARY

In this chapter the results were presented in three groups. The first was concerned with the academic performance of subjects in each of the categories defined by Applicant Status in Element #8; the second, with the value of the Admission Average as a predictor of university performance; and the third, with the value of selected variables as predictors, particularly for the marginal applicant.

For the analysis of performance of students grouped by Applicant Status, the "normal applicant" was defined as one who completed Grade 13 at the first attempt in the school year immediately preceding entry to McMaster University. There was no significant difference in the performance of other Grade 13 graduates and of the normal applicants, except in the Faculty of Humanities in which the performance of the normal applicants was better. Mature students in the Faculty of Social Sciences performed at a lower level than the normal applicants; those admitted with General Certificate of Education qualifications performed better than the normal applicants. Although statistical analysis was not possible for the other groups, it appears that the following groups performed at a lower level than the normal applicants: those who required more than one attempt at Grade 13, students from other provinces, and those with foreign qualifications other than the General Certificate of Education and qualifications gained in the United States. Those with qualifications from the U.S.A. and those who transferred from other universities appeared

to perform at about the same level as the normal applicants. The comparison of performance for the college students was inconclusive.

The value of the Admission Average as a predictor of university performance was investigated by calculating the correlation coefficients for Year I Overall Average with Admission Average for students grouped by faculty and sex who completed Grade 13 at the first attempt. The coefficients were compared to those reported by Khan and Rickard (1971b). There was no significant difference in the predictive value of the Admission Average for those admitted in 1974 from that for those admitted in 1969, except for males entering the Faculty of Science. For these students the correlation coefficient for the 1974 group was significantly higher than for the 1969 group.

Among students who completed Grade 13 at the first attempt, the performance of those in approximately the lowest quartile on the basis of Admission Average, the "marginal admittees", was significantly lower than that of students with higher averages. The Faculty of Social Sciences has admitted a limited number of students with averages below the stated minimum for admission on an experimental basis; the performance of this group is significantly lower than that of marginal admittees in that faculty.

The value of other variables as predictors for the marginal admittees was investigated. There was no significant difference in the performance of marginal admittees when grouped on the basis of either sex or age. Analysis of the performance of marginal admittees in the Faculties of Business and Engineering grouped on the basis of credits in Grade 13 Mathematics was not possible; for those in Science there was no significant difference in the performance of those with two and with

three credits of Grade 13 Mathematics. The difference for those in the Faculty of Science with one and with two credits of Grade 13 Mathematics was approaching significance. There was no significant difference in the performance of marginal admittees when divided into those who passed Grade 13 English and those who had not.

The performance of those who were admitted to the Faculties of Business, Engineering, and Science on the basis of GCE qualifications was significantly better than that of marginal admittees. The performance of mature students in the Faculty of Humanities was significantly lower than that of the marginal admittees.

Chapter VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study was designed to provide information which may be used in the evaluation of current admission requirements and selection procedures, and which may serve as a basis for recommending changes.

The specific problems addressed were:

1. Does the academic performance in Year I programmes of students admitted to the University in September 1974 on the basis of a number of different qualifications differ significantly from that of students who completed Grade 13 in a single year (the "normal admissions")?

2. Is the value of academic performance in Grade 13, as measured by the Admissions Average, as a predictor of university academic performance significantly different for students admitted in 1974 and 1969?

3. Can other selected variables be used to increase the probability of selecting students who will succeed academically in Year I programmes?

For the study the records of Year I, full-time students registered for the 1974-75 Winter Session in the Faculties of Business, Engineering, Humanities, Science, and Social Sciences, and the School of Nursing were retrieved from the McMaster Student Data Base, and a record comprised of nineteen elements was created on magnetic tape for each student.

After the data were edited and corrected, the magnetic tape file was used as input and SPSS (Statistical Package for the Social Sciences) was used for the analysis.

The performance of students in each faculty grouped on the basis of the qualifications presented to gain admission was compared to that of the "normal applicants". The normal applicants were Grade 13 graduates who passed Grade 13 at the first attempt in the school year immediately preceding entry to the University. For the analysis the Chi-Square test was used and the .05 level of significance employed; the dependent variable was Results of Session, which had three categories: "Clear", "Incomplete Year", and "Failed."

In the investigation of the predictive value of the Admissions Average for the 1974 and 1969 groups, the correlation between Year I Overall Average and Admission Average was determined. Pearson Product Moment Correlation coefficients were calculated for the 1974 group of students who passed Grade 13 at the first attempt; the students were grouped by faculty and sex, except in the case of the Faculty of Engineering for which males and females were grouped together. The coefficients obtained were compared to those reported for similar groups who entered the University in 1969 (Khan and Rickard, 1971b); the analysis was conducted by transforming the coefficients to z- scores and testing at the .05 level.

The investigation of the predictive value of other variables was concentrated on those students who had Admission Averages only slightly in excess of the minimum required for admission to the University. These students, the "marginal admittees", were compared to those who had Admission Averages in excess of an average which was specified for each

faculty; the analysis, which used the Chi-Square test and Results of Session as the dependent variable, revealed a significant difference in the performance of the two groups. The marginal admittees were subsequently grouped by faculty on the basis of sex, age, number of Grade 13 credits in Mathematics, and whether the students had taken and passed Grade 13 English. For each variable the performances of the groups created were compared; the Chi-Square test was used for the analysis and Results of Session as the dependent variable. The performance of the marginal admittees was compared to that of mature students, to that of students admitted on the basis of General Certificate of Education qualifications, and, in the case of the Faculty of Social Sciences, to a group of students admitted experimentally with averages below the stated minimum.

Each of the three problems identified above will be discussed in relation to the results reported in Chapter 5. The implications of the findings for the selection process are outlined, and the chapter is concluded with a section containing recommendations.

ACADEMIC PERFORMANCE OF STUDENTS WITH DIFFERING ADMISSION QUALIFICATIONS

In Chapter 3, it was noted that of the 2,886 subjects included in this study, 1,689 were admitted to the University after completing Ontario Grade 13 at the first attempt in the school year immediately preceding admission to the University. These students were designated "the normal applicants". It was suggested that one objective in setting admission requirements is to ensure that those admitted stand a reasonable chance of success, and a second is to ensure equity of treatment for

those presenting diverse academic qualifications in support of their
applications for admission. If these objectives are attained, one
might expect applicants admitted on the basis of other qualifications
to perform at the same level as the "normal applicants". The performance
of each group of students, classed on the basis of the qualifications
presented for admission, was compared to that of the normal applicants
and is discussed below.

Students who Completed Grade 13 at the First Attempt

Subjects who completed Ontario Grade 13 at the first attempt
were divided into the normal applicants and a second group comprised of
students who graduated in an earlier year and those who had taken one or
more Grade 13 courses prior to the 1973-74 school year. For students
in the Faculties of Business, Engineering, Science and Social Sciences
there was no significant difference at the .05 level in the performances
of the two groups, although the difference was approaching significance
in the Faculty of Science insofar as those in the second group had a
tendency to perform better than the normal applicants. There was a
significant difference in the performance of subjects in the two groups
in the Faculty of Humanities; members of the second group performed at
a lower level than the normal applicants. No explanation for the differ-
ences that exist among faculties is suggested.

On the basis of these results it is concluded that in most of
the faculties applicants from the two groups should be treated on an
equal basis.

Students who Completed Grade 13 with Multiple Attempts

In previous studies it has been found that a student who has

required multiple attempts to complete Grade 13 has a lower chance of success in university than an applicant with the same Admission Average who completed the Grade at the first attempt (Fleming, 1959, 1962; Boronkay, 1971a, 1971b, 1971c, 1971d, 1971e). It has been the practice of McMaster University to require a higher Admission Average of applicants who have spent more than a single year in Grade 13, although this was not done for students who entered the Faculty of Social Sciences in 1974.

The number of students from this group in each of the faculties was too small for analysis. Of the seventy-four students in this group, thirty-five (47 per cent) were clear to continue at the end of Year I; twenty-three (31 per cent) had an incomplete Year; eight (11 per cent) failed the Year; and eight (11 per cent) withdrew. It appears that the performance of this group was below that of students who completed Grade 13 at the first attempt, and that there are no grounds for recommending a change in the practice of requiring a higher Admission Average.

College of Applied Arts and Technology Graduates

Some of the students admitted to the University from colleges of applied arts and technology would have been admissible to a university after completing their secondary school programmes; others would not. The policy of the University has been generally to admit college graduates with first-class standing to Year II programmes. This means that those admitted to Year I programmes have normally maintained second-class standing in their college programmes.

There were thirty-three students in this group and it was not possible to analyze their performance, since the number in any one

faculty was small. Of this group nineteen (58 per cent) were either placed on the Deans' Honours list or were clear to continue; seven (21 per cent) had an incomplete Year; seven (21 per cent) either failed the Year or withdrew. It appears that the proportion in the first category is smaller for this group than for those who complete Grade 13 at the first attempt, although the proportion in the third group appears to be comparable to that for the Grade 13 group. Those who have an incomplete Year may have an opportunity to complete it by taking courses in the Summer Session or concurrently with Year II courses in the following session.

It appears reasonable, therefore, to continue to admit selected graduates of the colleges of applied arts and technology.

Students Transferring from Other Universities

Most students who transfer from other universities are able to obtain credit for work completed elsewhere, so that the number admitted to Year I programmes is small, only twenty-two. Almost 80 per cent of those admitted in 1974 were successful at their first attempt, which appears comparable to the performance of those admitted from Grade 13; therefore, it appears reasonable to continue to admit selected students from this group.

Mature Students

There were no mature students admitted to the Faculty of Engineering. The performance of mature students in the Faculties of Business, Humanities, and Science was reported, but there were too few students for analysis. In the Faculty of Social Sciences the performance of the mature students was significantly lower than that of the normal appli-

cants, although over 50 per cent of the mature students were clear to continue at the end of Year I. The performance of mature students in the Faculty of Social Sciences was not significantly different from that of the marginal admittees. In the case of the Faculty of Humanities, however, the performance of the mature students is significantly lower than that of the marginal admittees from that Faculty.

It should be noted that the mature student encounters a number of special difficulties at the time of admission to the University. In most cases he or she has been away from formal study for a number of years, and admission to a university is accompanied by a drop in income with little change in family responsibilities. There would seem to be need for a review of the admission procedures for those seeking admission under mature student privileges. This review should include the selection procedures and other procedures associated with the return of a mature student to formal study; there may be a need for special counselling or remedial work.

Qualifications from Other Provinces

Only twenty-four students registered in September 1974 after being admitted on the basis of qualifications obtained in other provinces. Of these ten (41 per cent) completed the Year, five (21 per cent) nad an incomplete Year, and nine (38 per cent) failed or withdrew.

The performance of this group appears to fall below that of students admitted from Grade 13. The qualifications presented may have been obtained in any of nine provinces. It appears that the present practice should be reviewed, although the number of students admitted to McMaster University is too small for a meaningful review to be

conducted. It may be appropriate for such a review to be conducted
on a provincial basis, since most universities in Ontario require the
same qualifications for applicants from other provinces.

Students with Qualifications from the U.S.A.

The current policy is to require at least one year of college
work before admission is granted. An exception might be made in the
case of a well-qualified applicant. Only seventeen students from this
group registered in September 1974; 70 per cent completed the Year,
which appears to be similar to the experience with Ontario Grade 13
graduates. No change in policy appears warranted.

Students with GCE qualifications

Of the ninety students in this group seventy-two (80 per cent)
registered in the Faculties of Business, Engineering, and Science
combined. The performance of students from this group in the Faculty
of Business was significantly higher at the .05 level than that of the
normal applicants. While the performance of the two groups was not
significantly different at the .05 level in the Faculty of Science,
there was a tendency for the GCE group to perform better; the value of
x^2 was approaching significance at the 0.1 level. The analysis could not
be performed for subjects in the Faculty of Engineering.

The performance of students with GCE qualifications in each of
the Faculties of Business, Engineering, and Science was significantly
higher than that of the marginal admittees in each of these faculties,
both at the .05 and .01 levels. In each of these three faculties enrol-
ment is limited and admission is by selection. If academic performance
in Year I were to be the sole criterion in making the admission decision,

this group might be given preference over the marginal admittees. Many of these students are not Canadian, neither are they landed immigrants, and this becomes a factor to be considered when spaces are limited and the major funding of universities is from the public purse.

The curriculum for the advanced level papers of the General Certificate of Education is such that student with such qualifications might be expected to have covered some of the work of Year I; consequently, it would be desirable to study the performance of this group in subsequent years of their university programmes.

Students with Other Foreign Qualifications

There were twenty-six students in this group with diverse backgrounds. At the end of the session fourteen (54 per cent) were clear to continue, six (23 per cent) had an incomplete year, and six (23 per cent) had either failed or withdrawn. The performance of this group appears to be below that of Grade 13 graduates.

Because of the diversity of the qualifications presented and the small number of students, one cannot draw conclusions. The apparently lower performance could be caused by non-academic factors, such as difficulties with language or in adjusting to a different culture.

ADMISSIONS AVERAGE AS A PREDICTOR OF UNIVERSITY ACADEMIC PERFORMANCE

Khan and Rickard (1971b) calculated Pearson Product Moment Correlation coefficients for university first-Year averages with a number of independent variables, which included the Admission Average. The study was conducted for the class which entered the University in 1969. The correlation coefficients were calculated by faculty and sex,

except for Engineering in which a single coefficient for both sexes was computed. Only students who completed Grade 13 at the first attempt were included. In this study the same procedure was followed for the same group of students who entered the University in 1974.

The correlation coefficients for the 1974 group did not differ significantly from those reported by Khan and Rickard (1971b) for students admitted in 1969, except for males entering the Faculty of Science. For males entering the Faculty of Science in 1974, the correlation coefficient was significantly higher at the .05 level than that for the same group in 1969. This supports the findings reported by Oksanen and Spencer (1975b) for students registered in the Faculty of Social Sciences, but does not support the suggestions reported by Boronkay and Bradley (1972) that the value of the Grade 13 marks as predictors would deteriorate. Both in 1969 and 1974 the Grade 13 average, the Admission Average, was the main factor in determining whether an applicant was admitted to the University. It appears that the selection process in 1974 was no less effective than that in 1969 in identifying those most likely to succeed academically in university.

While the coefficients were not significantly different except for the males in the Faculty of Science, some of the changes approached significance; in particular, this was apparent for students entering the Faculty of Engineering and for females entering the Faculty of Humanities. It appears that over the period from 1969 to 1974 there has been a tendency for the correlation coefficients for males and females in each of the faculties to become more nearly the same. Differences in academic achievement and predictability for males and females have been reported on numerous occasions; the performance of females has tended to be more

predictable (Black and Knowles, 1965a; Khan, Ransom and Herbert, 1970;
Khan and Rickard, 1971a and 1971b; Munday, 1970; Northby, 1958; Oksanen
and Spencer, 1975a; Paraskevopoulos and Robinson, 1970; and Reed and
Murphy, 1975). From 1960 to 1974 there has been a steady increase in
the proportion of females in the Year I class. This proportion rose
from 32 per cent in 1960 to 44 per cent in 1974; in 1969 the proportion
was 40 per cent. One possible explanation for the tendency may be that
previously, when fewer females were enrolled in universities, their
motivation was higher than that of their male counterparts. As the
proportion of female students in the University increases, one may find
that the academic performance of the females will take on more of the
characteristics of the male group.

PREDICTOR VARIABLES AND SELECTION PROCEDURES FOR GRADE 13 STUDENTS WITH LOW ADMISSION AVERAGES

In an attempt to overcome the limitations of correlation and
regression analysis in predicting an individual's academic performance,
Boronkay and Bradley (1972) developed the approach of Proportional
Analysis. They suggested granting admission to all who attained a
specified Admission Average which would be higher than the minimum
required. For students with averages below the specified Admission
Average, they recommended that admission should be by selection based on
a combination of predictor variables.

In Chapter 4, it was suggested that, if one seeks to improve the
selection procedures, one might do so by seeking to improve the procedures
for those who might be called "Marginal Admissions". For the purposes of
this study, the Marginal Admissions were defined as those subjects having

an Admission Average of at least 60.0 per cent, but less than that specified below for each faculty: Business, 65.0 per cent; Humanities, 68.0 per cent; Engineering 72.0 per cent; Science 70.0 per cent; and Social Sciences, 65.0 per cent.

In all faculties it was found that the performance of those defined as Marginal Admissions was significantly lower than that of those with higher Admission Averages. The former group were redefined as the "Marginal Admittees," and the effectiveness of other independent variables for this group as predictors of university academic performance was investigated. Discussion of these investigations follows.

Social Sciences Experimental Admission

Among the Grade 13 applicants there has been a special group who have been admitted on an experimental basis to the Faculty of Social Sciences with Admission Averages of less than 60.0 per cent, the minimum average normally required. This experiment was conducted because it was suggested that this group would perform no worse than students with Admission Averages in the range 60.0 to 65.0 per cent. The analysis indicated that there was a significant difference in the performance of subjects in the Faculty of Social Sciences with Admission Averages of less than 60.0 per cent, and those in the Faculty with averages in the range 60.0 to 65.0 per cent. Of the subjects with Admission Averages in the higher range, over 50 per cent were clear to continue, and 20 per cent had either failed the year or withdrawn. Of those with Admission Averages below 60.0 per cent 35 per cent of the subjects were clear to continue, and 30 per cent had either failed the year or withdrawn. While the performance of subjects in the latter group was significantly lower,

it should be noted that almost 70 per cent of the group were eligible
to continue their University studies. Of the 70 per cent, approximately
one half were able to continue without repeating work whereas the
remainder would find it necessary to repeat some of the work of Year I.

Sex

The analysis of the University performance of marginal admittees
grouped by sex could be performed only for subjects in the Faculties of
Humanities, Science, and Social Sciences. For these three groups there
was no significant difference at the .05 level in the first-Year Univer-
sity academic performance of male and female marginal admittees. In the
discussion of the correlation coefficients for University Overall Average
with Admission Average, it was suggested that the differences in perfor-
mance and predictability for males and females may be diminishing as the
proportion of females in the University approaches that of males. This
suggestion appears to be supported by the performances reported for
marginal admittees when categorized by sex.

It is concluded that the sex of the applicant is not of value in
the selection among marginal applicants.

Age at Entry to the University

In Ontario, Fleming (1959) reported that the age of students was
an important predictor of university performance, and Reed and Murphy
(1975) reported significantly different levels of performance as measured
by GPA for samples grouped on the basis of age. The performances of
marginal admittees aged eighteen and nineteen in each of the Faculties
were compared. In the case of marginal admittees to the Faculty of
Engineering, it was not possible to analyze the results. For all other

Faculties there was no significant difference at the .05 level in the performance of marginal admittees admitted at age eighteen and of those admitted at age nineteen. Only in the case of the Faculty of Science did the results approach significance; those admitted at age eighteen had a tendency to perform slightly better than those admitted at age nineteen.

Only in the case of the Faculty of Science was it possible to analyze the performance of those admitted at age seventeen and those admitted at age nineteen. There was no significant difference in the performance of the two groups in the Faculty of Science.

Age at entry appears to be of limited value in making selections among marginal applicants.

Grade 13 Mathematics

For students entering the Faculties of Engineering and Science, credits in Grade 13 Mathematics were required in 1974. For those entering the Faculty of Business at least one credit in Grade 13 Mathematics will be required for admission in 1976. The value of the number of credits passed in Grade 13 Mathematics as a predictor of university academic performance was investigated for each of the three faculties.

Among the marginal admittees to the Faculty of Business, there were too few without credits in Grade 13 Mathematics to analyze the relative performance of those admitted with Grade 13 credits in Mathematics and those without. However, those admitted without credits in Grade 13 Mathematics appeared to have less chance of being clear to continue than those who had credit in Grade 13 Mathematics.

The number of marginal admittees in the Faculty of Engineering

who had two credits in Grade 13 Mathematics was too small to analyze
the relative performances of those with two credits and those with
three credits in Grade 13 Mathematics. It appears, however, that those
with three credits stand a better chance of being clear to continue than
do those with only two credits.

The difference in performance of marginal admittees in the
Faculty of Science with one credit and those with two credits in Grade 13
Mathematics was approaching significance. It is suggested that the
performance of marginal admittees with only one credit in Grade 13 Math-
ematics should continue to be reviewed.

There was no significant difference in the first-Year University
performance of marginal admittees registered in the Faculty of Science
who had three credits and those who had two credits of Grade 13 Math-
ematics.

On the basis of these results, it appears that the number of
credits in Grade 13 Mathematics obtained by a marginal applicant is of
limited value as a predictor. Further study may be desirable; marginal
admittees from two or three years should be included to ensure that the
sample size is sufficiently large to perform the analysis. The grading
scale and academic regulations of the University were changed in Sep-
tember 1974, so it would not be appropriate to include marginal admittees
from earlier years in such a study.

The level of achievement in Grade 13 Mathematics may be of more
value than the number of credits obtained by students. The results
obtained do not permit an evaluation of whether the subject requirements
for admission specified by the Faculties of Business, Engineering, and
Science in the area of Mathematics are appropriate.

Grade 13 English

During the public debate in 1975 through the news media of university admission, it was suggested that those seeking to enter universities should write an Achievement Test in English (Newspaper References). Freshmen entering the University in the Fall of 1975 were required to write an English Language Achievement Test. In the Faculties of Engineering and Science there was no significant difference in the first-Year University performance of marginal admittees who had passed an English Grade 13 course and those who had not. The analysis could not be conducted for students in the other faculties, but there appeared to be no difference in the performance of the two groups.

The passing of an English course appears to be of little value as a predictor of success for marginal admittees.

Selection Among Marginal Admittees

The four independent variables investigated appear to add little to the prediction of university performance by the Admission Average. Further investigation of the utility of Grade 13 Mathematics may be desirable for the Faculties of Business, Engineering and Science, but it appears that the passing of Grade 13 English is of little value as a predictor. It is recommended that there be continuing study of the value of other predictors.

In the absence of more positive results it is suggested that the admission policy be reviewed within the context of the broader University policies. Should the potential academic performance of an applicant be the only consideration in admitting students? It might be appropriate, for example, for the University to give priority among the marginal

applicants to those from the local area. For some the extra financial burden of attending a university elsewhere may prove too much of a deterrent.

IMPLICATIONS OF THIS STUDY FOR
THE SELECTION PROCESS

Previous research conducted on admissions at McMaster University has concentrated on graduates of Ontario Grade 13. In this study, tne academic performance of all students in Year I was examined, and a major part of the study was concerned with tne performance and selection of those Ontario Grade 13 applicants who present an average marginally above the required Admission Average.

For September 1975 admission to the Faculties of Business, Engineering, and Science was by selection; these same three Faculties and the School of Physical Education will have enrolment targets for the 1976-77 Session so that selection will be necessary. The results reported in this study should assist those who have to select a limited number of students, and to identify where more information is required.

For the student seeking to enter the University after completing Ontario Grade 13, it appears that the average of Grade 13 marks continues to be the best single predictor of university performance available, and that the predictive value of the Grade 13 average is similar to that reported in 1969. Only for males entering the Faculty of Science was the correlation of Year I average and Admission Average significantly different from that reported in 1969; the correlation coefficient was higher for the 1974 group than for the 1969 group. The Grade 13 average has been the main criterion for deciding whether a student should be admitted to the

University , and it is recommended that this continue.

Only in the Faculty of Humanities was there a significant difference in the performance of normal applicants and others who completed Ontario Grade 13 at the first attempt. This Faculty will not have limited enrolment in 1976; it is recommended that all Ontario Grade 13 graduates be treated equally irrespective of whether they seek to enter the University directly from Grade 13 or after an interruption in their studies.

There was a significant difference in the performance of students with low Admission Averages and of those placed in approximately the top three quartiles on the basis of Admission Average. It is recommended that for faculties with limited enrolment admission be granted to applicants who attain a specified Admission Average which is higher than the minimum required. Those with an average between the minimum and that specified should be given more detailed consideration. The results reported for the marginal admittees suggest that discrimination on the basis of sex and age is not warranted, and more study is required in the case of Grade 13 Mathematics, although it may be of some value. In the more detailed consideration attention might be given to factors such as place of residence, and specific subjects of interest to the student in terms of the physical resources available.

The standard practice of the University has been to require a higher Admission Average for those applicants who have required multiple attempts to complete Grade 13. There is no evidence to suggest discontinuing this practice.

While the numbers admitted from Ontario Colleges of Applied Arts and Technology were too few for analysis, it is apparent that many performed satisfactorily in the University, and it appears appropriate to

continue to admit a number of such applicants.

The performance of students transferring from other universities appears to be similar to that of the normal applicant. Consequently, it is recommended that the University continue to accept transfer students into Year I programmes.

A review of the mature student application procedure appears to be warranted; mature students seem to perform less well than the Grade 13 graduates, but no worse than the marginal admittees except in the case of mature students admitted to the Faculty of Humanities.

Those admitted from other provinces are few in number and have disparate backgrounds. It appears that the performance of this group is below that of the normal applicant and that further study would be appropriate.

Among the foreign student applicants, those admitted on the basis of General Certificate of Education qualifications appear to perform well. Those entering with qualifications from the United States appear to perform at about the same level as the normal applicants, and those admitted on the basis of other foreign qualifications appear to perform less well.

RECOMMENDATIONS

The recommendations presented in this chapter are summarized in this section.

The specific recommendations which emerge from this study are as follows:

1. that in the admission of students the Admission Average based on Grade 13 marks continue to be one of the major criteria for selection;

2.   that all applicants who complete Grade 13 at the first attempt
be treated equally in the selection process irrespective of the year in
which they graduated from Grade 13;

3.   that a higher Admission Average continue to be required of those
who take more than one year to complete Grade 13;

4.   that the University continue to admit by selection graduates of
the colleges of applied arts and technology;

5.   that the University continue to admit by selection students who
seek to transfer from other universities;

6.   that there be a review of the admission procedures for those
seeking admission under mature student privileges;

7.   that there be a review, perhaps on a province-wide basis, of
the performance of students admitted on the basis of qualifications
from other provinces;

8.   that there be no change in the policies regarding the admission
of students with qualifications gained in the United States or with GCE
qualifications;

9.   that for those programmes with limited enrolment admission be
granted to applicants who attain a specified Admission Average which is
higher than the minimum required, and that the applications of those
with lower averages be given more detailed consideration with the final
selection being made not solely on academic criteria;

10.   that there be further investigation of the predictive value of
other variables for the group termed "marginal admittees;" and

11.   that there be further study of the value of Grade 13 Mathematics
as a predictor of university performance in the Faculties of Business,
Engineering, and Science.

RECOMMENDATIONS FOR FURTHER RESEARCH

This study has dealt only with the performance of the students in Year I at the University. Previous studies have suggested that predictors such as high school average are of limited value beyond the first year's performance at a university (Berdie and Prestwood, 1975; Humphreys, 1968). It would be desirable to extend this study to follow the applicants through their university programmes. It is recommended that the performance of the marginal admittees and those with higher Admission Averages be compared using Results of Session for subsequent Years as the dependent variable in a manner similar to that used in this study. However, it would be necessary to develop the procedures carefully for those students who drop out between academic sessions and those who transfer to other programmes. It would appear inappropriate to classify such students among those who have withdrawn. It is suggested that the correlations among the Admission Average and the Overall Averages for the various Years in the university programmes be examined.

Among the Year I class are students who are repeating part or all of the Year. They may be repeating voluntarily, or repeating following failure or withdrawal. If there is a limit on the number of places in Year I in a faculty, this group of students occupies places that could otherwise have been given to new students. It would, therefore, be appropriate to study the performance of the repeating student and it is recommended that the methodology be that employed in this study for comparing the performance of those with various qualifications with that of the normal applicants.

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APPENDIX A

DATA ELEMENTS CONTAINED IN
EACH RECORD

The methodology outlined in Chapter III called for the creation
of a magnetic tape file which contained a record for each full-time
student in a Year programme in 1974-75, using data extracted from the
McMaster University Student Data Base. The data recorded on the
magnetic tape file served as input in using SPSS (Statistical Package
for the Social Sciences) in this and future studies.

In this appendix the data elements identified and the reasons
for their identification are discussed. The data elements are
summarized and then each is discussed in sequence.

The data elements defined were as follows:

Element Number	Description	Length
1	Record Number	4
2	Student Number	7
3	Abbreviated Surname	12
4	Age at Entry	2
5	Sex	1
6	Marital Status	1
7	County of Residence	2
8	Applicant Status	2
9	McMaster Choice	1
10	Admission Average	4 (format F4.1)
11	High School Principal's Rating	1
12	English Grade 13 Mark	2
13	reserved	
14	Mathematics Grade 13 Mark	2
15	Number of Grade 13 Mathematics credits	1
16	reserved	

Element Number	Description	Length
17	University Programme	2
18	Overall Weighted Average	4 (format F4.1)
19	Results of Session	1

Element #1 - Record Number

A Record Number was assigned sequentially commencing with 0001 for the purpose of facilitating file maintenance and random sample selection.

Element #2 - Student Number

Each applicant seeking to enter the University is assigned a student number; it was included to facilitate access to other files for checking and correcting data.

Element #3 - Abbreviated Surname

This was included to facilitate access and cross-reference to other files and lists for checking and correcting data.

Element #4 - Age at Entry

This element contained a two-digit number equal to the age of the student in years on August 31 in the Year of entry to the University.

In Ontario, Fleming (1959) reported that the age of student was an important predictor, and Reed and Murphy (1975) reported significantly different levels of performance as measured by GPA for samples grouped on the basis of age.

Element #5 - Sex

Differences in academic achievement and predictability for males and females have been reported on numerous occasions. At McMaster University, Oksanen and Spencer (1975a) reported that in the Social Sciences females tended to perform better than males, all other things being equal. The studies conducted under the auspices of OISE revealed that the predictive ability of the independent variables tended to be higher for females than for males (Khan, Ransom, and Herbert, 1970; Khan and Rickard, 1971a, 1971b). The tendencies for higher female achievement and predictability have been noted elsewhere (Black and Knowles, 1965a; Munday, 1970; Northby, 1958; Paraskevopoulos and Robinson, 1970; Pollock, Bowman, Gendreau, and Gendreau, undated; Reed and Murphy, 1975).

Element #6 - Marital Status

The relative performance of married and single students has received little attention, while that of mature students has been the subject of a number of studies (Atkinson, 1948; Batt, 1972; Paraskevopoulos and Robinson, 1969; Perkins, 1971; Reed and Murphy, 1975). Some of these studies have suggested that the performance of mature adults will be better than that of regularly admitted young adults, all other things being equal. Among the mature adults there is a greater proportion of married students. This suggests that further investigation of Marital Status as a predictor may be warranted. The coding structure identifies single and married subjects in two categories. The occurrences of the categories "separated", "divorced", and "widowed" are not sufficiently frequent to merit their being assigned separate codes.

Element #7 - County of Residence

The selection problem faced by a university with an excess demand from applicants for too few places must be viewed from more than one position. One stance would be to argue that admission should be given to those best qualified academically, but this may overlook the obligations of a university, as a public institution, to its community. The identification of this community has been a matter of public concern, and so becomes a concern of the universities (Newspaper References). This element is included to permit further examination of these issues.

The coding structure is such that each Ontario resident may be identified by county, to permit an examination of the performance of those for whom McMaster University is within commuting distance. Non-Ontario residents are identified by a single code.

Element #8 - Applicant Status

This element identifies the nature of the educational qualifications presented by an applicant for the purpose of gaining admission to the University. A two-digit number code is used.

Applicants admitted from Ontario secondary schools may be divided into those admitted from Grade 12 and those admitted from Grade 13. Those in the former group are extremely few, whereas the latter group comprised the largest group among Year I students. This latter group has been sub-divided into four on the basis of the number of years spent in Grade 13, and whether the applicant completed Grade 13 at the first attempt in one school year and entered the University immediately thereafter. The students in this latter group are identified as the "normal applicants". Those who have taken more than a single year in Grade 13 have been found to have a lower chance of success in university than a single-year applicant with the

same admission average (Fleming, 1959, 1962; Boronkay, 1971a, 1971b, 1971c, 1971d, 1971e). Reed and Murphy (1975) noted that studies of mature adult performance had suggested that mature adults performed differently from regularly admitted freshmen and that this had been attributed to the age and life experience of mature applicants. It is for this reason that the coding structure has been devised to identify those Grade 13 graduates who did not take Grade 13 in the year 1973-74 and enter the University immediately thereafter.

Students entering after completing a preliminary year at an Ontario university, from an Ontario College of Applied Arts and Technology, and on transfer from another university are identified within three categories. The performance of transfer students has been the subject of many investigations (Burke, 1973; Eaton, 1971; Falkenberg, 1967; Hills, 1965; Wray and Leischuk, 1971). The programmes of the CAATS are designed as terminal and not transfer programmes. Isaacs (1974) reported on students transferring from CAATS; others have reported on those transferring from similar programmes elsewhere (Batt and Janssen, 1974; Grieder and Cassady, 1974).

Those admitted under mature student provisions have been the subject of numerous studies and are identified by a separate code (Batt, 1972; Fagin, 1971; Groenke, 1969; Ice, 1971; Perkins, 1971; Reed and Murphy, 1975; Ryan, 1969; Sensor, 1964; Stephen and Wheeler, 1969; Winslow, 1968).

Applicants with qualifications from other provinces are too few to identify by province. They have, therefore, been assigned a single code.

Applicants from the U.S.A. are identified by a separate code.

Other foreign applicants are identified in two groups: those with
General Certificate of Education qualifications and those with other
qualifications. Baker (1975) noted that those with General Certificate
of Education qualifications generally were successful at a university
in the U.S.A., and the coding structure has been established to identify
this group.

In addition to newly-admitted students, there are returning
students registered in Year I at the University. Although this group has
been excluded from this study, provision has been made within the coding
structure to include these students, since research has been conducted
into the performance of such students (Bluhm and Couch, 1972; Lautz,
MacLean, Vaughan, and Oliver, 1970; Meadows and Ingle, 1968). This group
is comprised of those repeating voluntarily, those repeating following
withdrawal during a previous academic year, and those repeating following
a failed year. Three codes have been provided, therefore, for identi-
fying returning students.

Element #9 - McMaster Choice

At the time of application through the Ontario Universities'
Application Centre, each applicant is permitted to name three programmes
and rank them in order of preference. The practice of McMaster Univer-
sity to date has been to ignore the choice preference stated by applicants,
but this practice is subject to review at a time of selective admission.
Choices have been coded "1", "2", and "3".

Element #10 - Admission Average

The Admission Average is the weighted mean of the marks obtained
by the applicant in those Grade 13 subjects used to satisfy the admission

requirements of the University programme. It is the most readily
available measure of the student's academic achievement in high school,
which consistently has proved to be the best single predictor of first-
year university performance (Boronkay, 1971a, 1971b, 1971c, 1971d, 1971e;
Khan and Rickard, 1971a, 1971b; Weiss, 1970). The Grade 13 marks are
assigned by teachers, and are expressed as percentages.

Element #11 - High School Principal's Rating

The High School Principal's Rating is the rating category assigned
by the applicant's high school principal at the time of application for
admission to university. Ratings range from "Recommended for Scholarship"
to "Success Unlikely" and are represented by a single-digit code.

Within Ontario it has been reported that the principal's rating
as an additional contributor to the prediction was of marginal value
(Fleming, 1962, 1965).

Element #12 - English Grade 13 Mark

The English Grade 13 Mark recorded is the weighted mean of all
English Grade 13 courses taken in the last year spent in Grade 13, and is
expressed as a percentage. This element has been included because of the
interest that has been expressed in testing the level of achievement of
applicants in English and Mathematics (Newspaper References).
Element #13 has been reserved to provide for recording the score obtained
by an applicant in any standardized test designed to measure the achieve-
ment or aptitude level in English of an applicant.

Element #14 - Mathematics Grade 13 Mark

The Mathematics Grade 13 Mark recorded is the weighted mean of all
Mathematics courses taken in Grade 13 in which the applicant obtained a

mark of at least 50 per cent and is expressed as a percentage. The
element has been included both because of the interest that has been
expressed in testing the level of achievement of applicants in English
and Mathematics (Newspaper References), and the research findings noted
in the discussion of Element #15 below. Element #16 has been reserved
to provide for recording the score obtained by an applicant in any
standardized test designed to measure the achievement or aptitude level
in Mathematics of an applicant.

Element #15 - Number of Grade 13 Mathematics Credits

The Number of Grade 13 Mathematics Credits is defined as the
number of credits, as defined by the Ontario Ministry of Education, of
Grade 13 Mathematics in which the student obtained marks of 50 per cent
or better. This element may be used to identify those who have passed
no Grade 13 Mathematics courses, and those with differing levels of
experience in Mathematics.

At McMaster University, in some programmes the performance of
students who had written Grade 13 Mathematics appeared to differ from
that of those who had not (Boronkay, 1971c, 1971e; Oksanen and Spencer,
1975a).

Element #17 - Programme

The Programme is defined as the Year I programme in which the
student was registered in the 1974-75 Session; a two-digit code has
been assigned to each programme.

Previous research has suggested that independent variables will be
of differing predictive value for the various programmes applicants seek
to enter. This has been reported at McMaster University (Boronkay, 1971a,

1971b, 1971c, 1971d, 1971e), elsewhere in Ontario (Fleming, 1962; Khan, Ransom, and Herbert, 1970; Khan and Rickard, 1971a, 1971b), in other Provinces (Black and Knowles, 1965b; Knowles, 1965; Mack, 1963), and in the United States (Berdie and Prestwood, 1975; Baker, 1975).

Element #18 - Overall Average

The Overall Average is the weighted mean of the precentage marks scored by the student in the courses of his first year at the University. It is one of the two criterion variables to be used in this series of studies.

The use of the Overall Average as one of the criterion variables permits comparison of the results of these studies with those of previous studies at the University (Boronkay, 1971a, 1971b, 1971c, 1971d, 1971e; Khan, Ransom, and Herbert, 1970; Khan and Rickard, 1971a, 1971b). Since it is a continuous variable, it permits the use of the techniques of correlation and regression which have been employed in many of the studies of this type.

Element #19 - Results of Session

The Results of Session is a categorical variable assigned to report the student's academic standing at the University upon completion of one year. It is to be used as the second criterion variable. Within the coding structure provision has been made for five categories: Dean's Honours, Clear to Continue in the Programme, Incomplete Year, Failed Year, and Student Withdrew during the Session.

The use of Overall Average, or a Grade-Point Average, as the criterion variable means that a study may not include subjects who with-drew and those for whom an average cannot be calculated. In selective

admission the potential withdrawal of a student is of interest, and it has been suggested that the level of previous academic achievement may be related to the withdrawal of a student (Astin, 1969; Spenser, 1975). The limitations of the techniques of correlation and regression nave been noted in the literature (Boronkay and Bradley, 1972; Paraske-vopoulos and Robinson, 1970; Weiss, 1970; Whitney and Boyd, 1971), and there has been increasing use of categorical criterion variables similar to Results of Session (Batt and Janssen, 1974; Menacker, Paraskevopoulos and Robinson, 1971; Pollock, Bowman, Gendreau, and Gendreau, undated).

APPENDIX B

CODING STRUCTURE

Element #1:   Record Number

               4-digit number assigned sequentially, commencing with 0001.

Element #2:   Student Number

               7-digit number assigned to each student at the University.

Element #3:   Abbreviated Surname

               The first 12 characters of the subject's Surname.

Element #4:   Age at Entry

               2-digit number equal to age in years on August 31 of the
                 year of entry to the University.

Element #5:   Sex

               1 Male
               2 Female

Element #6:   Marital Status

               1 Single
               2 Married

Element #7:   County of Residence

               Code   Description

               01   Algoma
               03   Brant
               04   Bruce
               06   Carleton
               07   Cochrane
               10   Dufferin
               11   Dundas
               12   Durham
               15   Elgin
               16   Essex
               19   Frontenac
               20   Glengarry
               21   Grenville
               22   Grey
               25   Haldimand
               26   Haliburton

Code	Description
27	Halton
28	Hastings
29	Huron
31	Kenora
32	Kent
35	Lambton
36	Lanark
37	Leeds
38	Lennox
39	Lincoln
40	Metro Toronto
41	Manitoulin
42	Middlesex
43	Muskoka
44	Niagara
45	Nipissing
46	Norfolk
47	Northumberland
50	Ontario
51	Oxford
53	Parry Sound
54	Peel
55	Perth
56	Peterborough
57	Prescott
58	Prince Edward
60	Rainy River
61	Renfrew
62	Russell
65	Simcoe
66	Stormont
67	Sudbury
70	Temiskaming
71	Thunder Bay
73	Victoria
75	Waterloo
76	Welland
77	Wellington
78	Wentworth
80	York
99	Non-Ontario

Element #8:   Applicant Status

12	Ontario Grade 12
13	Students completing Ontario Grade 13 at first attempt in school year immediately preceding admission to the University
14	Students completing Ontario Grade 13 with multiple attempts in year of admission

Applicant Status

15	Others completing Ontario Grade 13 at first attempt
16	Students completing Ontario Grade 13 with multiple attempts in an earlier year
17	Preliminary year (equivalent to Grade 13) completed at an Ontario university
18	Ontario C.A.A.T.
19	Transfer from another university
20	Mature (Special) student
22	Qualifications from other provinces
23	U.S.A. qualifications
24	G.C.E. qualifications
25	Other foreign qualifications
26	Repeating Year voluntarily
27	Repeating Year following withdrawal
28	Repeating Year following failed Year
29	No application

Element #9:   McMaster Choice

1   McMaster named as first choice
2   McMaster named as second choice
3   McMaster named as third choice

Element #10: Admission Average

Percentage recorded as xxxx (Format F4.1)

Element #11: High School Principal's Rating

1   Recommended for scholarship
2   Outstanding
3   Above average
4   Average
5   Below average
6   Success unlikely

Element #12: English Grade 13 Mark

Percentage recorded as xx

Element #14: Mathematics Grade 13 Mark

Percentage recorded as xx

Element #15: Number of Grade 13 Mathematics Credits

0	0 credits
1	0.5 credits
2	1.0 credits
3	1.5 credits

Element #15:   Number of Grade 13 Mathematics Credits

          4   2.0 credits
                         etc.

Element #17:   Programme

          01   Business I
          02   Engineering I
          03   Experimental I
          04   Humanities I
          05   Music I
          06   Natural Science I
          07   Nursing I
          08   Physical Education
          09   Social Sciences I

Element #18:   Overall Average

          Percentage recorded as xxxx (Format F4.1)

Element #19:   Result of Session

          1   Deans' Honours
          2   Clear to Continue in the Programme
          3   Incomplete Year
          4   Failed Year
          5   Withdrew During Session

APPENDIX C

SPECIFICATIONS FOR PRODUCTION OF
THE DATA FILE

Project:

    To compile a Data File for full-time, Year I students in the 1974-75 Session.

Input:

    McMaster Student Data Base.

Records to be selected:

    1. Select students who were full-time in the 1974-75 Winter, and were registered in Year I programmes in Business, Engineering, Humanities, Nursing, Science, and Social Sciences.

    2. Exclude:

        a. students who are deceased
        b. students studying for credit at another university
        c. Occasional students
        d. students registered in the Divinity College, the School of Medicine, and the School of Graduate Studies.

Parameter Card:

    Parameter card to carry value of year of entry (e.g., for September 1974, value = '74').

Output:

    1. Data File on magnetic tape
        Sequence - Year I programme (as defined in Element #17), Student Name
        Layout as in APPENDIX D.

    2. Print-out of the contents of the Data File.
        One line per record
        Sequence - Year I programme, Student Name Format as in APPENDIX E.

    3. Control Report
        One line per message generated during processing, with the following on each line: Record #, McMaster Student #, Surname, Message.
        Sequence - Year I programme, Student Name
        Format as in APPENDIX F.

4. Summary Statistics
    For Elements 4, 5, 6, 8, 9, 11, 15 and 19 display a table.
    In each table the columns are to represent each of the
        programmes defined in Element #17 and a final column
        for the total; the rows are to represent each of the
        values for the particular Element.
    Each intercept gives the number of occurrences of those
        values represented by the row and column.

Processing:

For each student selected create a record with the following elements:

Element #1: Record Number
              Assign each record a number in ascending sequence, commencing
                  with 0001.

Element #2: Student Number
              Read the McMaster Student Number and write it to the
                  Data File.

Element #3: Abbreviated Surname
              Read Last Name and write the first 12 characters to the
                  Data File.

Element #4: Age at Entry
              Read Birthdate and calculate the age in years as of
                  August 31 in the year of entry, the value of which
                  is on the parameter card
              Write the age calculated to the Data File; if age is
                  greater than 24, write 25
              If Birthdate blank, print on Control Report
                  "BLANK DATE OF BIRTH".

Element #5: Sex
              Read Sex
              If Sex = M, assign code = 1
              If Sex = F, assign code = 2
              If Sex = blank, print on Control Report "BLANK SEX".

Element #6: Marital Status
              Read Marital Status
              If Marital Status = S or W or D, assign code = 1
              If Marital Status = M, assign code = 2
              If Marital Status = blank, print on Control Report
                  "BLANK MARITAL STATUS".

Element #7: County of Residence
              Read County of Ontario
              If County code is in the range of 001 to 080 inclusive,
                  write the last two digits to the Data File
              Otherwise read Province of Canada and Country
                  If there is a value, assign code = 99

Element #7:   County of Residence
                If County, Province, and Country fields are blank,
                  print on Control Report "BLANK COUNTY CODE"
                If County = 99, print on Control Report
                  "BLANK COUNTY CODE".

Element #8:   Applicant Status
                Read Application Status, Registration Status, and
                  Grade 13 Status
                Assign code for Data File as follows:

Data File Code	Application Status	Grade 13 Status	Reg'n Status
12	90		
13	01 OR 02		
13	03 OR 51	AND 1	
14	03 OR 51	AND 2	
15	04 OR 05 OR 15	AND 1 OR blank	
16	04 OR 05 OR 15	AND 2	
17	14		
18	11 OR 40 OR 41		
19	10 OR 45		
20	08		OR 14
21	25		
22	20,21,22,23,24,26,27,28,29 OR 46		
23	31 OR 43		
24	32 OR 33		
25	07,39,47 OR 56		
26			11
27			12
28			13
29	blank		

If Applicant Status has one of the values below, print the appropriate
message on the Control Report:

```
06,52,53,57,59,99      "APPLICANT STATUS?"
09                     "APPL. STATUS CONTINUING"
12                     "APPL. STATUS OCCASIONAL"
13                     "APPLICATION CANCELLED"
16                     "CREDIT ELSEWHERE"
44,55                  "JUNIOR COLLEGE"
49                     "TRANSFER"
```

Element #9: McMaster Choice
             Read McMaster Choice and write to Data File.

Element #10: Admission Average
             Read Admission Grade 13 Average and write to Data File
             If McMaster Applicant Status code = 01 OR 02 OR 03 OR
               04 OR 05 OR 13 OR 15 OR 51, AND Admission Grade 13
               Average is blank, print on Control Report "ADMISSION
               AVERAGE BLANK".

Element #11: High School Principal's Rating
             Read Principal Rating and write to Data File.

Element #12: English Grade 13 Mark
             Read the marks of all English courses taken in the last
               year of Grade 13
             Calculate the weighted mean and write to Data File
             If there are no English marks, this field should be blank.

Element #13: Reserved.

Element #14: Mathematics Grade 13 Mark
             Read all marks $\geqslant$ 50 in all Mathematics Grade 13 courses
             Calculate the weighted mean and write to Data File
             If there are no English marks, this field should be blank.

Element #15: Number of Grade 13 Mathematics Credits
             Total the number of credits in the Mathematics Grade 13
               courses included in Element #14
             Multiply the total by 2, and write the integer value
               calculated to Data File.

Element #16: Reserved.

Element #17: University Programme

Read University Programme and assign codes, as follows:

University Programme	Code Assigned
0-725	01
0-730	02
0-740	03
0-700 (except 0-700-370)	04
0-700-370	05
0-710	06
6-390	07
0-430	08
0-725	09

If University Programme = blank, print on Control Report "PROGRAMME BLANK".

Element #18: Overall Weighted Average
Read Weighted Average and write to Data File
If Result of Session = 09 (Withdrew), no message printed
Otherwise, if Weighted Average = blank, print on Control
Report "OVERALL AVERAGE BLANK".

Element #19: Results of Session

Read Results of Session and assign codes, as follows:

Results of Session	Code Assigned
15	1
01,02,03,21,22,23,24,25,26,30	2
04,05,06,07,08,10,11,17,18,20,27,28⎱	
29,31,32,33,34,35 ⎰	3
12,13	4
09	5

If Results of Session = blank, 14,16,19 OR 99, print on Control Report "RESULT OF SESSION?"

APPENDIX D

RECORD LAYOUT ON DATA FILE

Element #	Character Positions	Length	Data Element
1	1-4	4	Record Number
2	7-13	7	Student Number
3	14-25	12	Abbreviated Surname
4	28-29	2	Age at Entry
5	31	1	Sex
6	33	1	Marital Status
7	35-36	2	County of Residence
8	40-41	2	Applicant Status
9	43	1	McMaster Choice
10	50-53	4	Admission Average
11	55	1	High School Principal's Rating
12	57-58	2	English Grade 13 Mark
13			(Reserved)
14	65-66	2	Mathematics Grade 13
15	67-68	2	# of Grade 13 Mathematics credits
16			(Reserved)
17	72-73	2	University Programme
18	75-78	4	Overall Weighted Average
19	80	1	Result of Session

APPENDIX E

SAMPLE PRINT-OUT OF DATA FILE

APPENDIX F

SAMPLE OF EDIT CONTROL REPORT

PGM - SA0351

12/10/75

LISTING OF INCORRECT AND MISSING DATA

PROGRAM 01

SEQUENCE NO	STUDENT NO	SURNAME	ERROR MESSAGE
9	72	W	ELEMENT 18 - OVERALL AVERAGE BLANK
17	73	P	ELEMENT 18 - OVERALL AVERAGE BLANK
23	73	B	ELEMENT 8 - APPLICATION STATUS ?
30	73	H.	ELEMENT 8 - APPLICATION STATUS ?
70	74	F	ELEMENT 19 - RESULT OF SESSION ?
258	74	P	ELEMENT 18 - OVERALL AVERAGE BLANK
338	74	L	ELEMENT 7 - BLANK COUNTY CODE
344	74	R	ELEMENT 8 - APPLICATION STATUS ?
348	74	K.	ELEMENT 8 - APPLICATION STATUS ?
373	74	N	ELEMENT 8 - APPLICATION STATUS ?
394	74	M.	ELEMENT 10 - HIGH SCHOOL AVERAGE BLANK
397	74	L	ELEMENT 8 - APPLICATION STATUS ?
416	74	M	ELEMENT 8 - APPLICATION CANCELLED